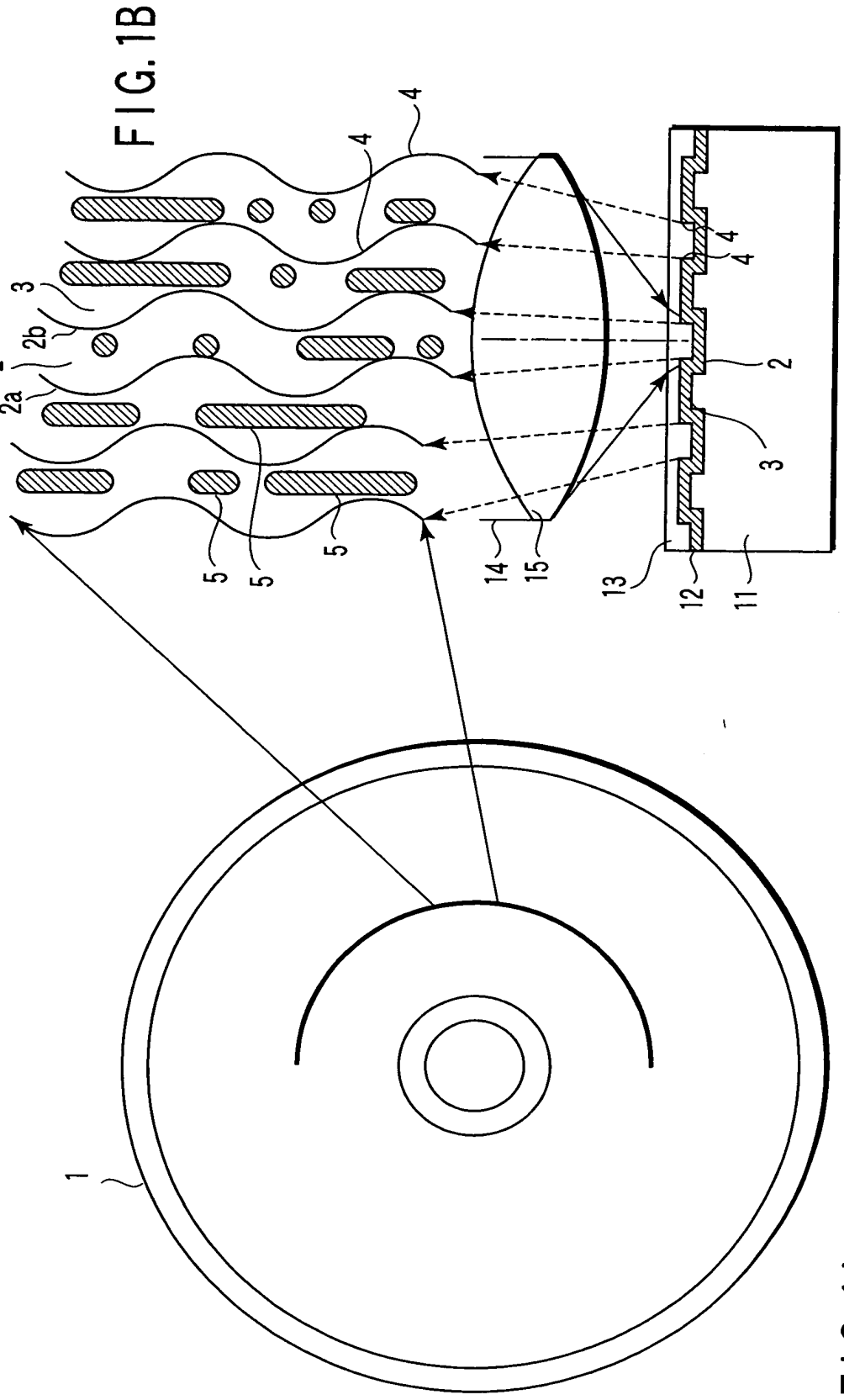
FIG.1B
FIG.1C
FIG.1A
1
2
2a
2b
3
4
5
11
12
13
14
15

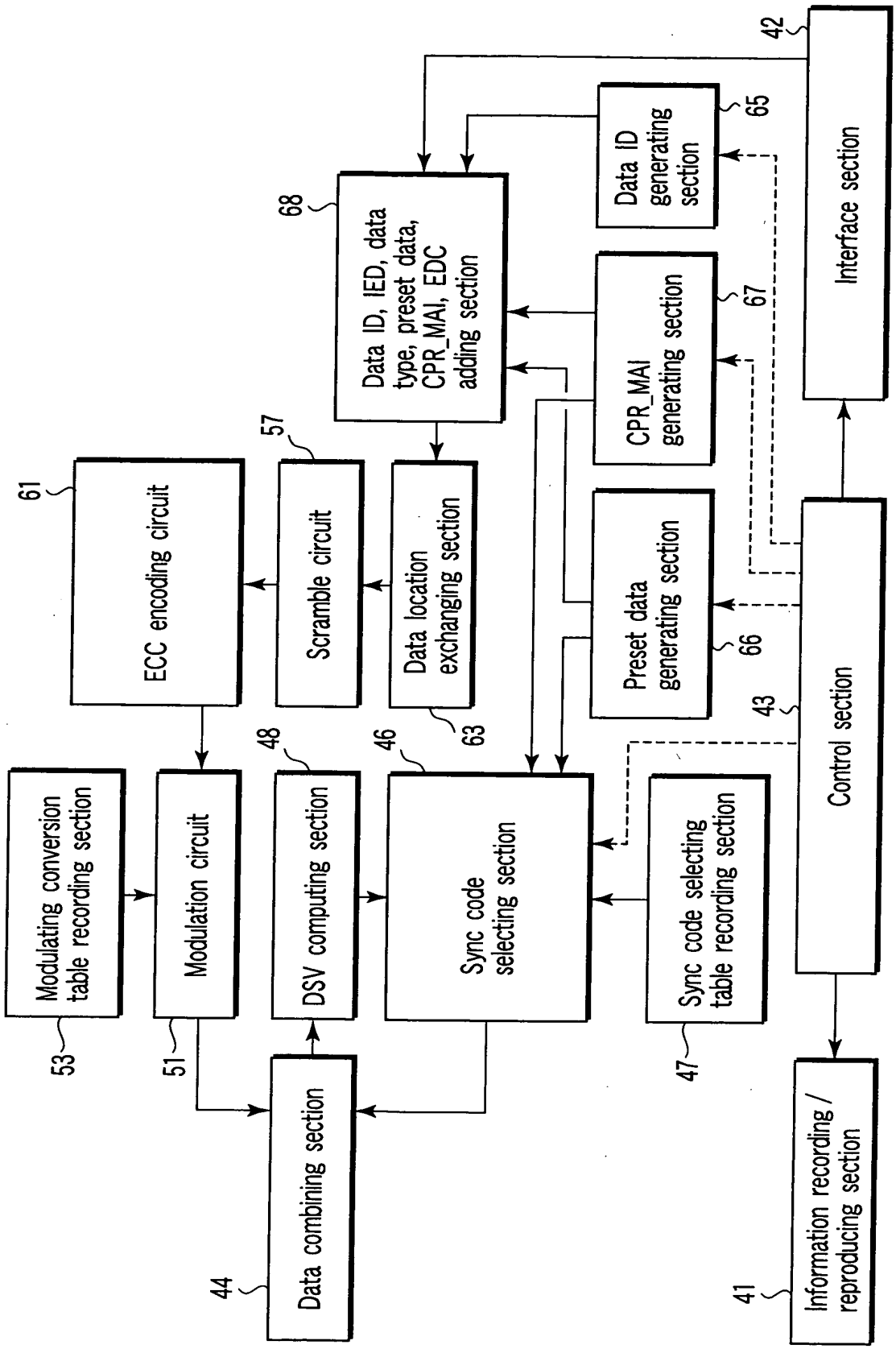
42
Interface section
65
Data ID generating section
68
Data ID, IED, data type, preset data, CPR_MAI, EDC adding section
67
CPR_MAI generating section
57
61
ECC encoding circuit
Scramble circuit
Data location exchanging section
Preset data generating section
66
43
Control section
63
48
46
53
Modulating conversion table recording section
Modulation circuit
DSV computing section
Sync code selecting section
Sync code selecting table recording section
51
47
44
Data combining section
41
Information recording / reproducing section

FIG. 2

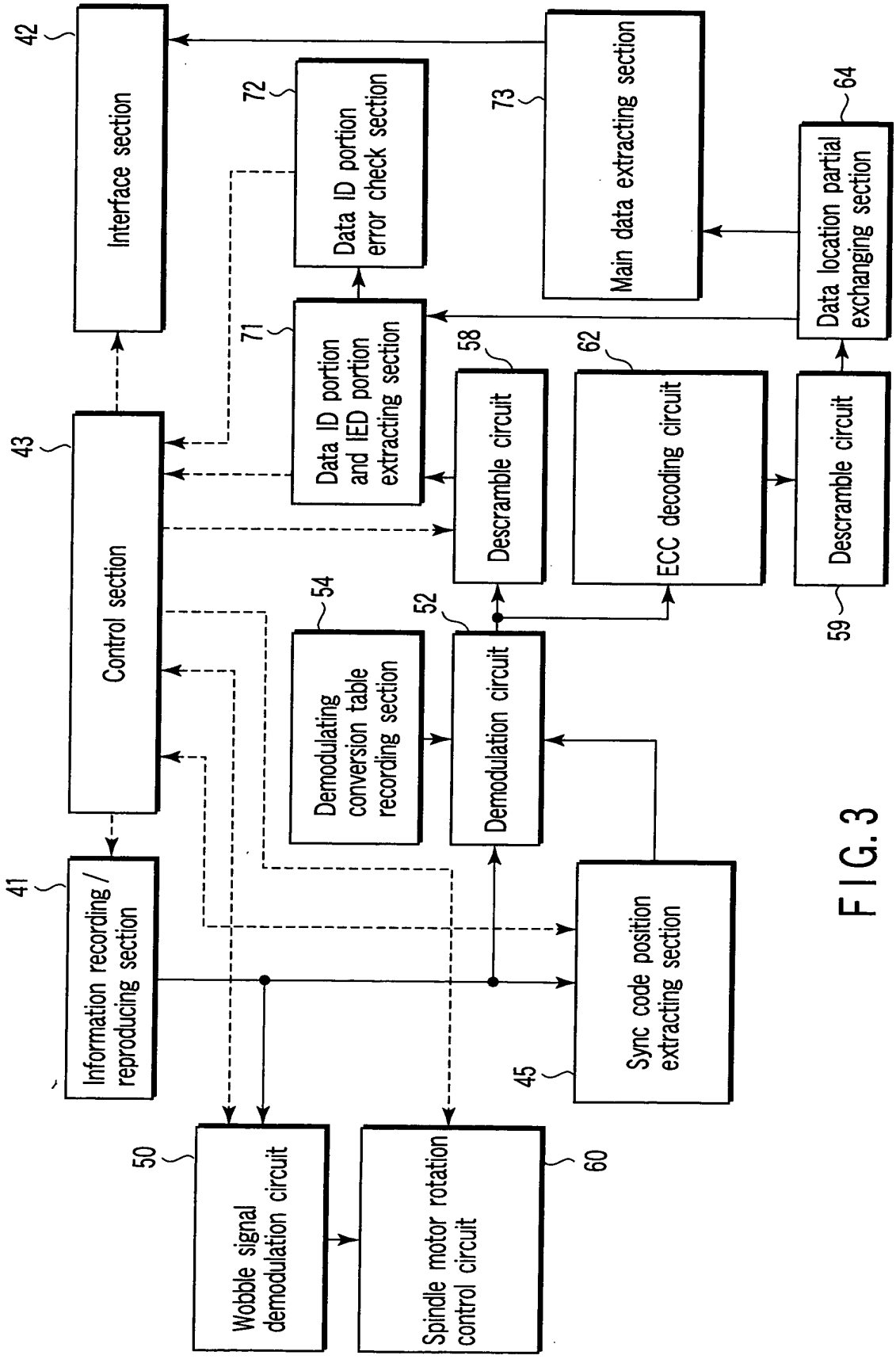
42
Interface section
72
Data ID portion error check section
73
Main data extracting section
64
Data location partial exchanging section
71
Data ID portion and IED portion extracting section
58
Descramble circuit
62
ECC decoding circuit
Descramble circuit
59
43
Control section
54
Demodulating conversion table recording section
52
Demodulation circuit
41
Information recording / reproducing section
45
Sync code position extracting section
50
Wobble signal demodulation circuit
Spindle motor rotation control circuit
60

FIG. 3

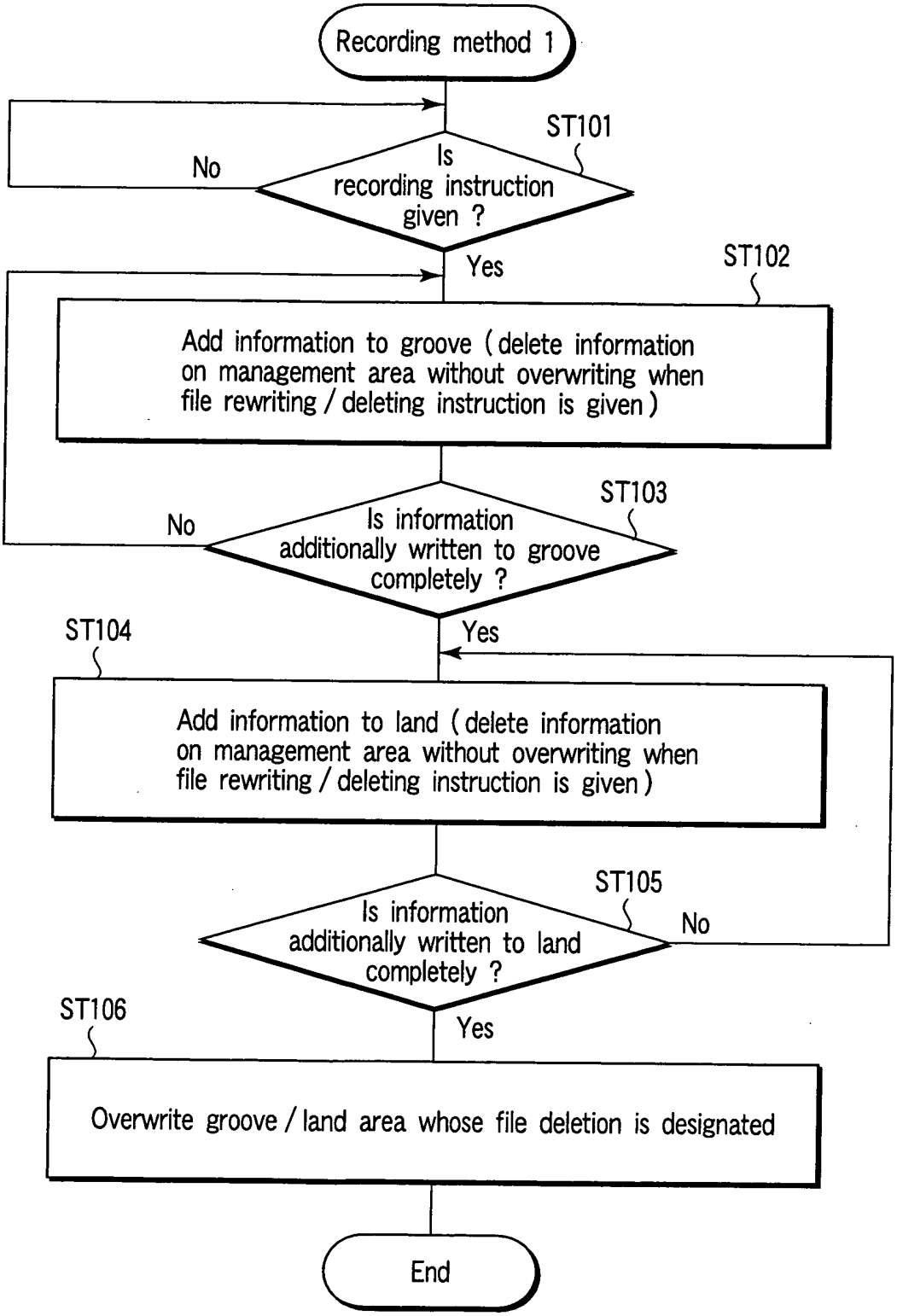
Recording method 1
ST101
Is recording instruction given ?
No
Yes
ST102
Add information to groove (delete information on management area without overwriting when file rewriting / deleting instruction is given)
ST103
Is information additionally written to groove completely ?
No
Yes
ST104
Add information to land (delete information on management area without overwriting when file rewriting / deleting instruction is given)
ST105
Is information additionally written to land completely ?
No
Yes
ST106
Overwrite groove / land area whose file deletion is designated
End

FIG. 4

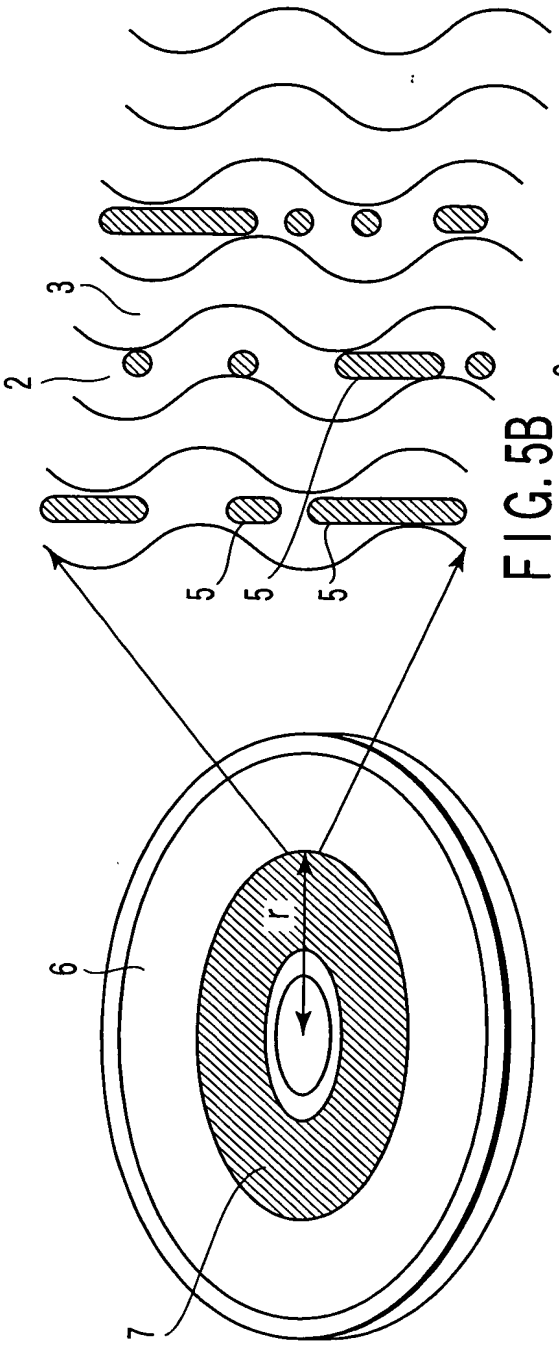

FIG. 5A

FIG. 5B

FIG. 5C

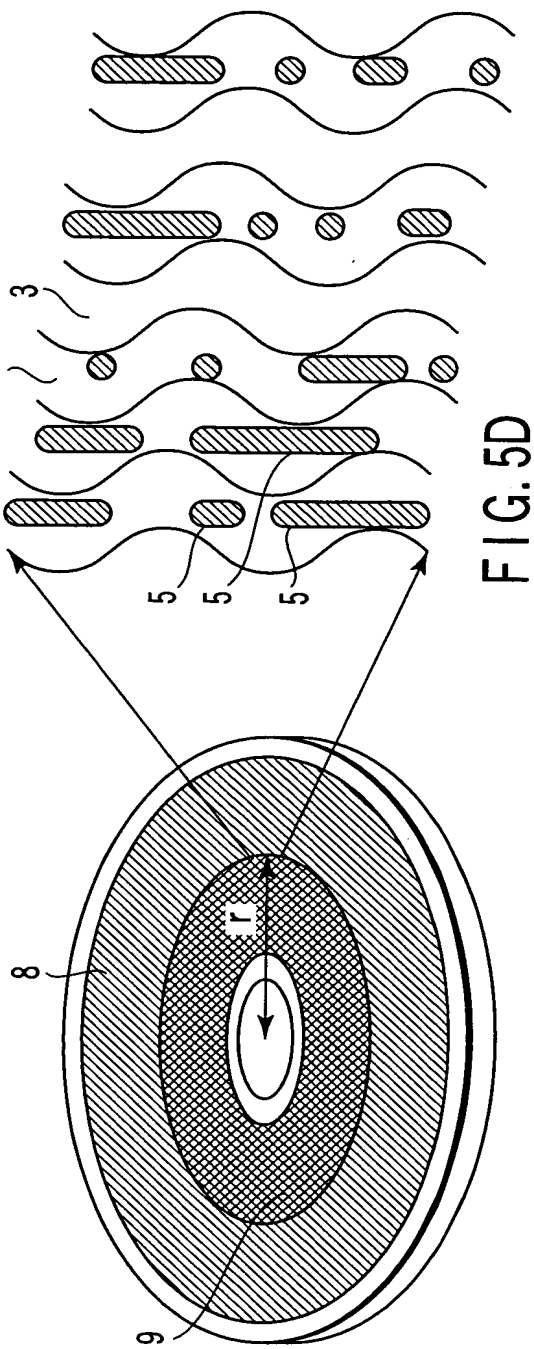

FIG. 5D

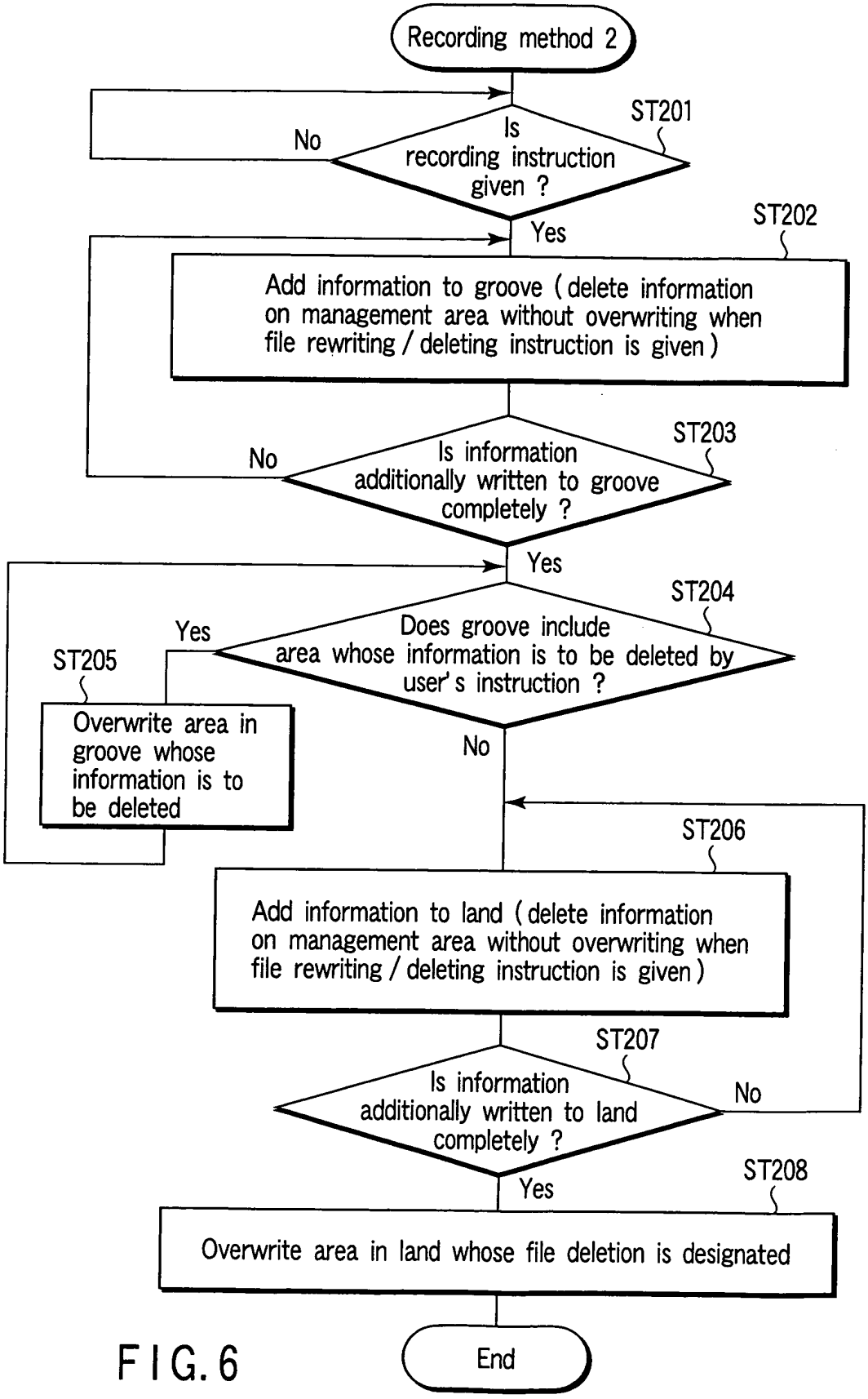
Recording method 2
ST201
Is recording instruction given ?
No
Yes
ST202
Add information to groove (delete information on management area without overwriting when file rewriting / deleting instruction is given)
ST203
Is information additionally written to groove completely ?
No
Yes
ST204
Does groove include area whose information is to be deleted by user's instruction ?
Yes
ST205
Overwrite area in groove whose information is to be deleted
No
ST206
Add information to land (delete information on management area without overwriting when file rewriting / deleting instruction is given)
ST207
Is information additionally written to land completely ?
No
Yes
ST208
Overwrite area in land whose file deletion is designated
End

FIG. 6

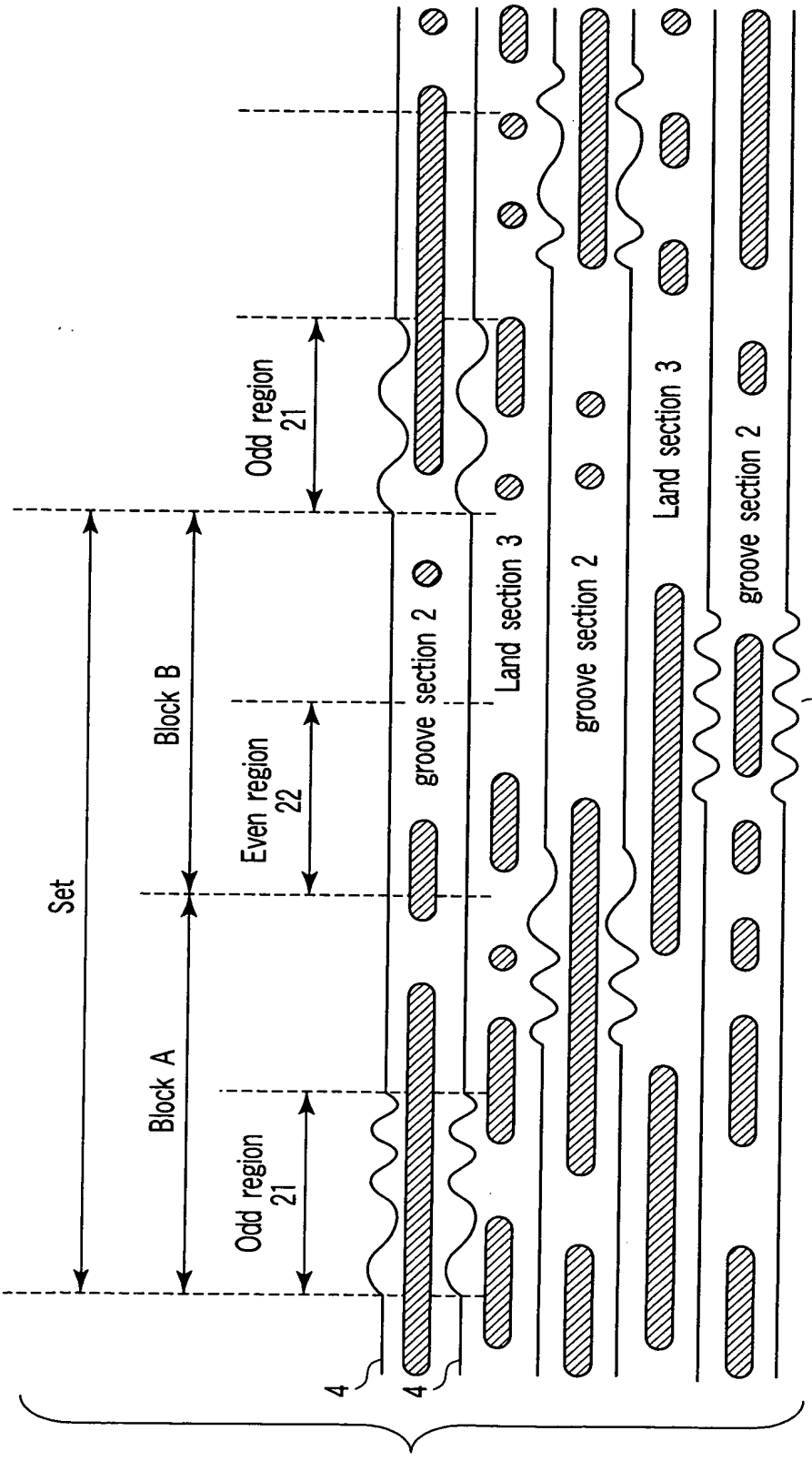
Set
Block A
Block B
Odd region 21
Even region 22
Odd region 21
groove section 2
Land section 3
groove section 2
Land section 3
groove section 2
Wobble address region 23
4
4

FIG. 7

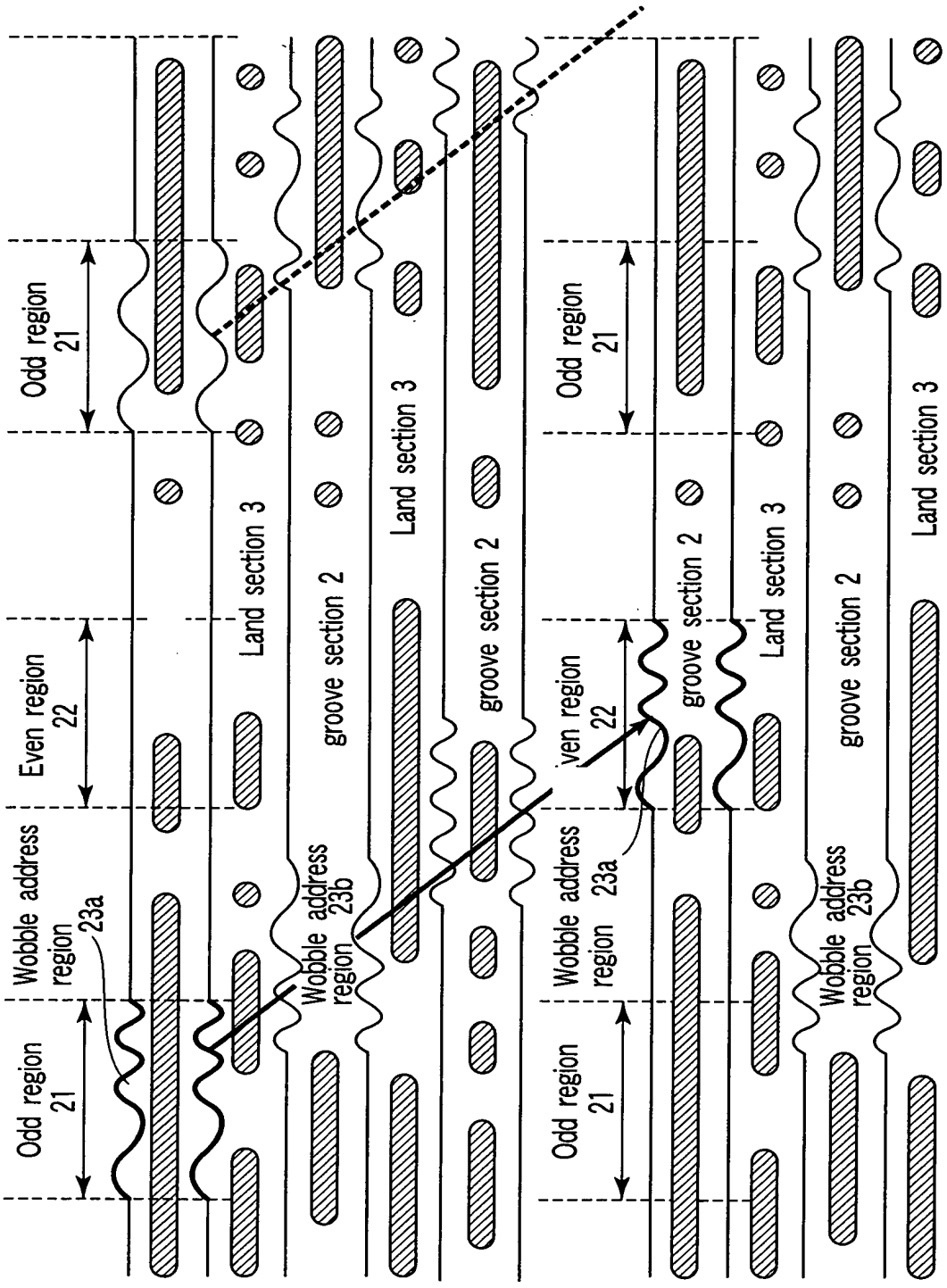
Odd region 21
Even region 22
Wobble address region 23a
Wobble address region 23b
Land section 3
groove section 2
Land section 3
groove section 2
Odd region 21
ven region 22
Wobble address region 23a
groove section 2
Land section 3
Wobble address region 23b
groove section 2
Land section 3
Odd region 21

FIG. 8A

FIG. 8B

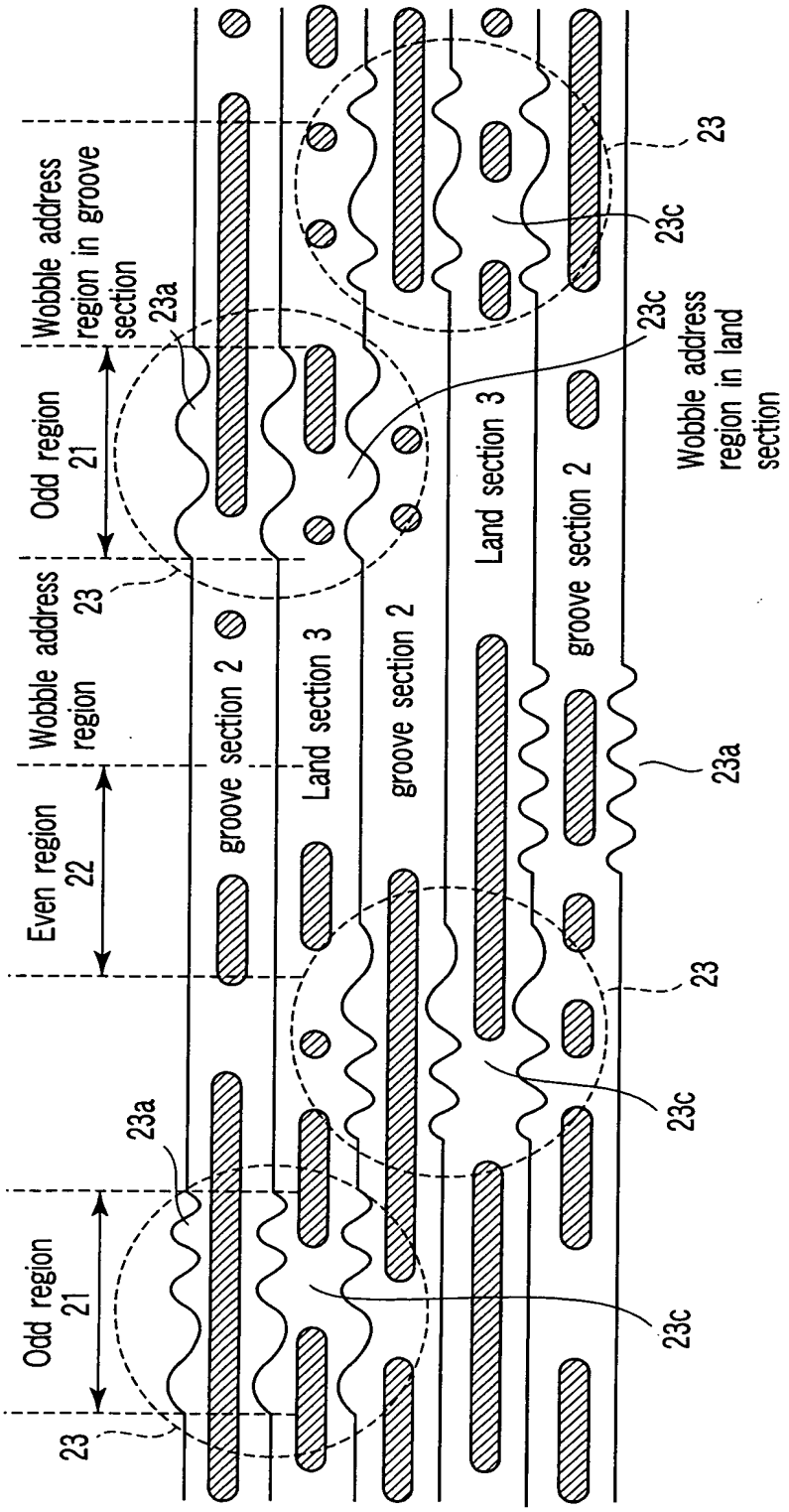
Wobble address region in groove section
Odd region 21
Wobble address region 23
Even region 22
Odd region 21
23
23a
23c
groove section 2
Land section 3
groove section 2
Land section 3
groove section 2
Wobble address region in land section

FIG. 9

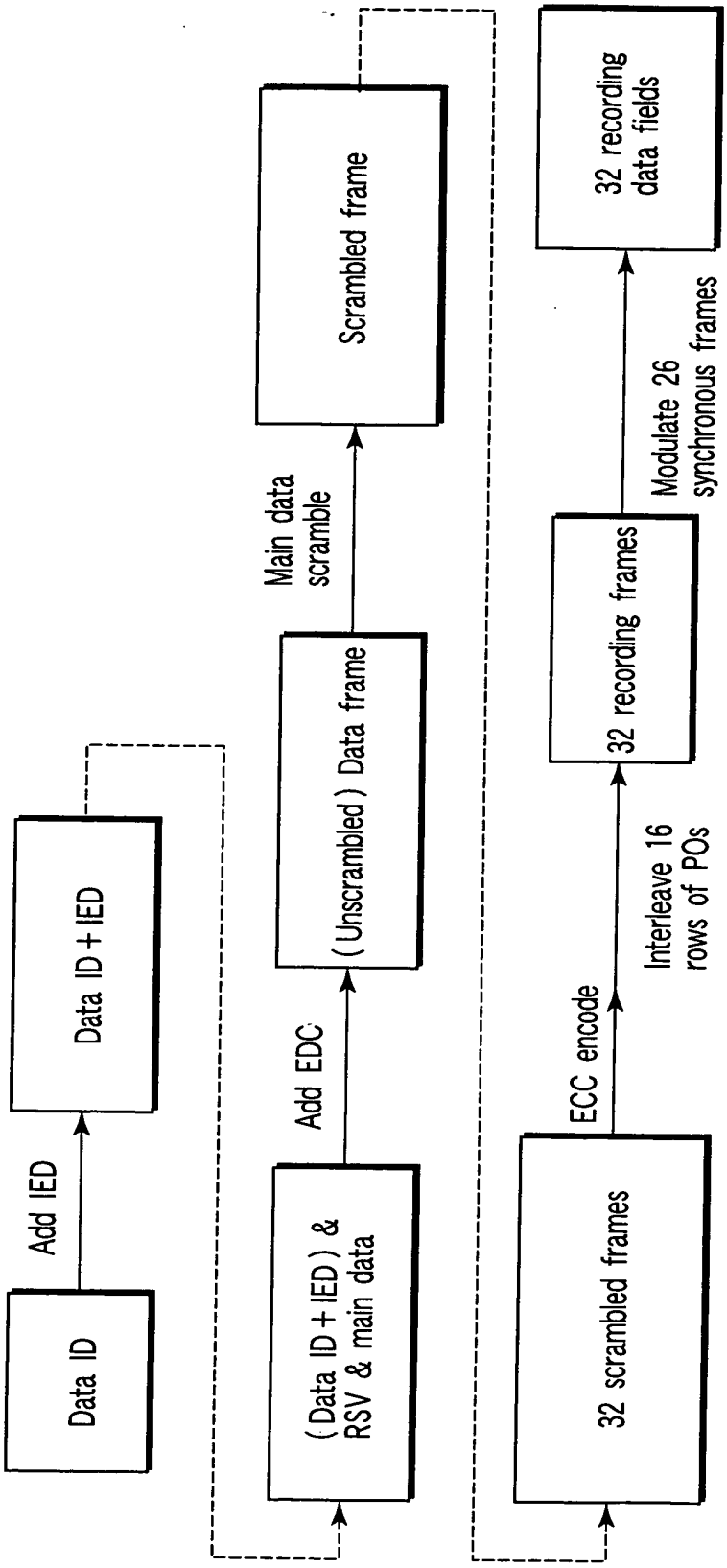
Data ID
Add IED
Data ID + IED
(Data ID + IED) & RSV & main data
Add EDC
(Unscrambled) Data frame
Main data scramble
Scrambled frame
32 scrambled frames
ECC encode
Interleave 16 rows of POs
32 recording frames
Modulate 26 synchronous frames
32 recording data fields

FIG. 10

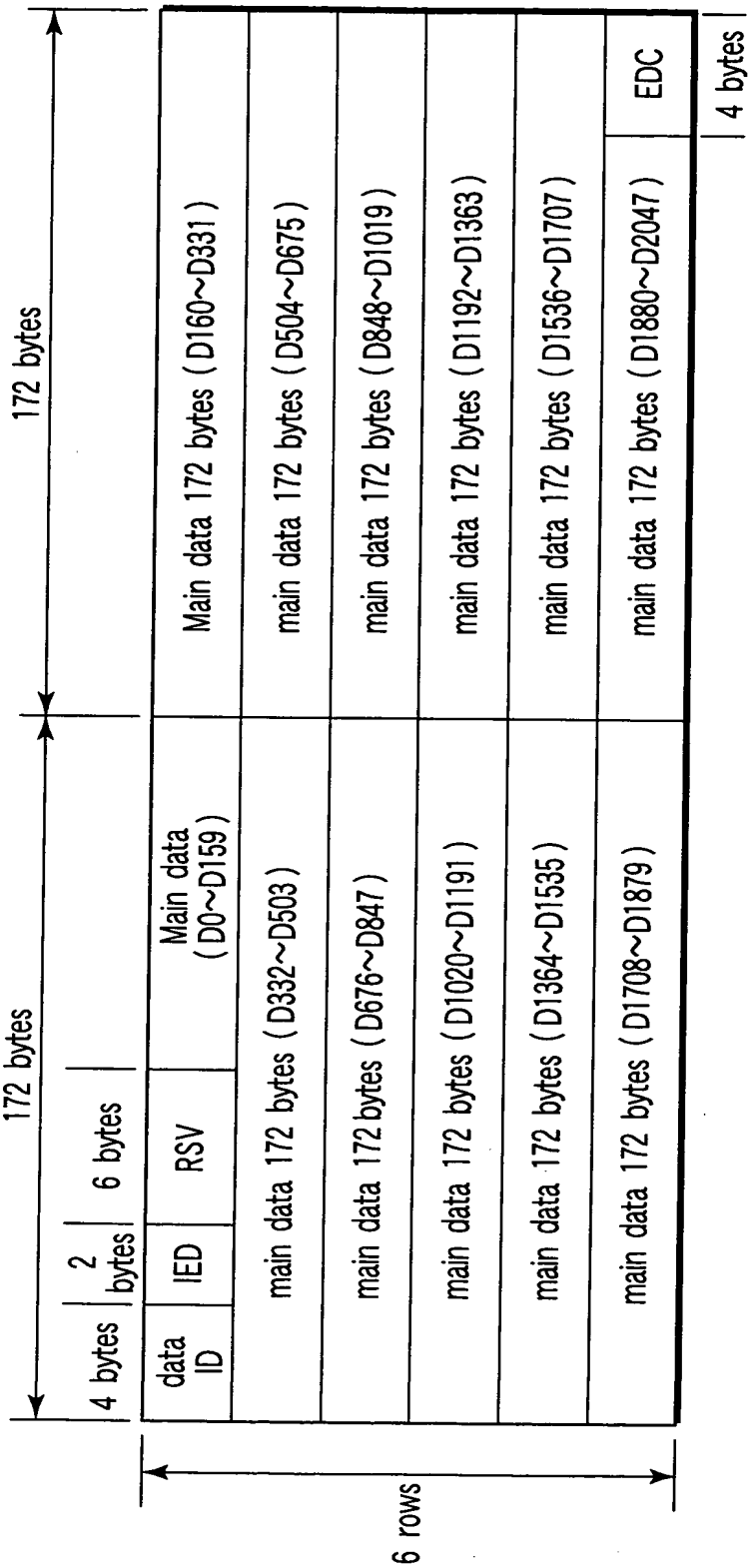
172 bytes
172 bytes
4 bytes
2 bytes
6 bytes
data ID
IED
RSV
Main data (D0~D159)
Main data 172 bytes (D160~D331)
main data 172 bytes (D332~D503)
main data 172 bytes (D504~D675)
main data 172 bytes (D676~D847)
main data 172 bytes (D848~D1019)
main data 172 bytes (D1020~D1191)
main data 172 bytes (D1192~D1363)
main data 172 bytes (D1364~D1535)
main data 172 bytes (D1536~D1707)
main data 172 bytes (D1708~D1879)
main data 172 bytes (D1880~D2047)
EDC
4 bytes
6 rows

FIG. 11

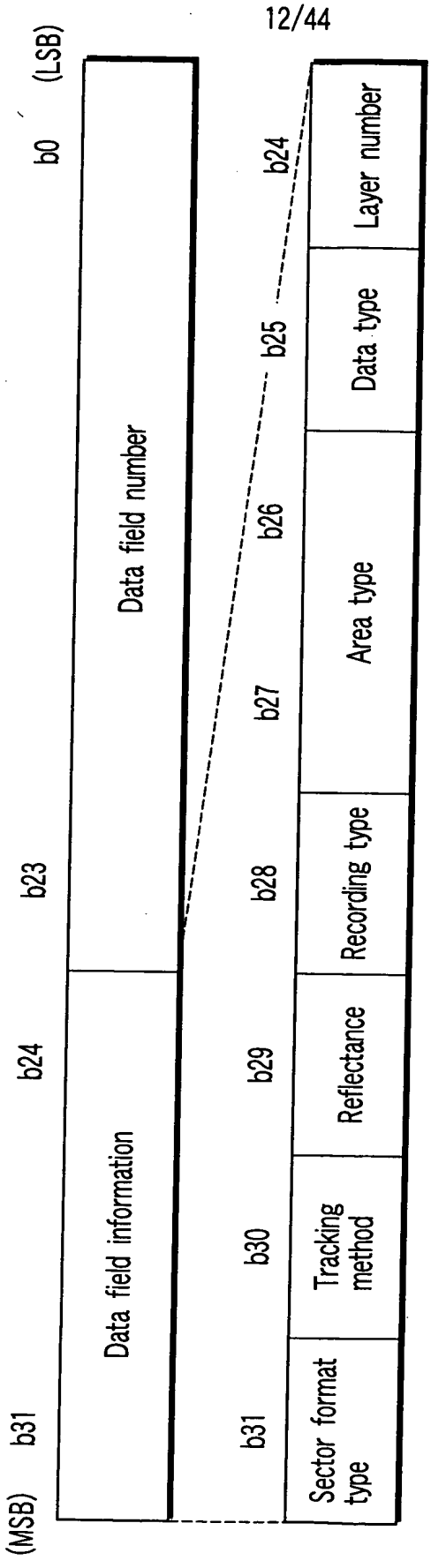
(MSB)
b31
b24
b23
b0
(LSB)
Data field information
Data field number
b31
b30
b29
b28
b27
b26
b25
b24
Sector format type
Tracking method
Reflectance
Recording type
Area type
Data type
Layer number

FIG. 12

Area	Contents
Embossed data zone	Sector number
Defect management area	Sector number
Disk identification zone	Sector number
Block used in data area	LSN + 031000h
Block unused in data area	One of state 1 : first 3 bits are 0 and number is subsequently incremented, state 2 : between 00 0000h and 00 00Hh, and state 3 : Unrecorded

FIG. 13

Area		Contents
Embossed data zone		Reserved
Rewritable data zone	Lead-in area, lead-out area	Reserved
	Data area	0b : General data 1b : Real-time data

FIG. 14

Initial preset number	Initial preset value	Initial preset number	Initial preset value
0h	0001h	8h	0010h
1h	5500h	9h	5000h
2h	0002h	0Ah	0020h
3h	2A00h	0Bh	2001h
4h	0004h	0Ch	0040h
5h	5400h	0Dh	4002h
6h	0008h	0Eh	0080h
7h	2800h	0Fh	0005h

FIG. 15A

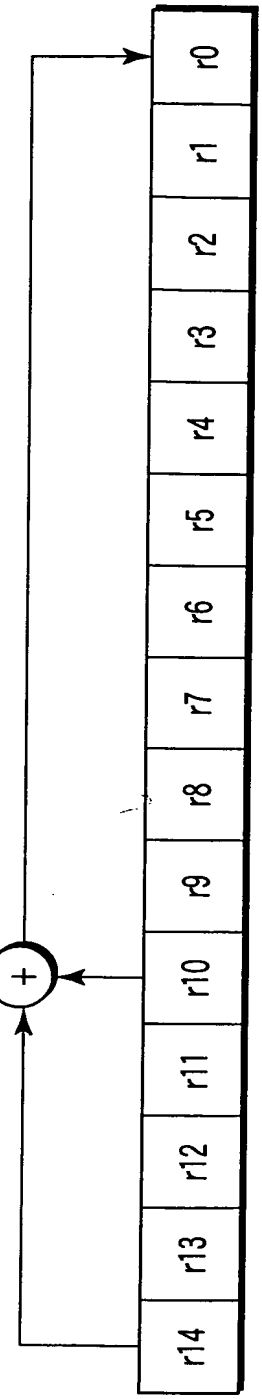

FIG. 15B

	← 172 bytes →			← 10-byte PI →		← 172 bytes →			← 10-byte PI →	
192 rows	B0,0	B0,171	B0,172	B0,181	B0,182	B0,353	B0,354	B0,363		
	B1,0	B1,171	B1,172	B1,181	B1,182	B1,353	B1,354	B1,363		
	B2,0	B2,171	B2,172	B2,181	B2,182	B2,353	B2,354	B2,363		
	B189,0	B189,171	B189,172	B189,181	B189,182	B189,353	B189,354	B189,363		
	B190,0	B190,171	B190,172	B190,181	B190,182	B190,353	B190,354	B190,363		
	B191,0	B191,171	B191,172	B191,181	B191,182	B191,353	B191,354	B191,363		
16 rows of PO	B192,0	B192,171	B192,172	B192,181	B192,182	B192,353	B192,354	B192,363		
	B207,0	B207,171	B207,172	B207,181	B207,182	B207,353	B207,354	B207,363		

FIG. 16

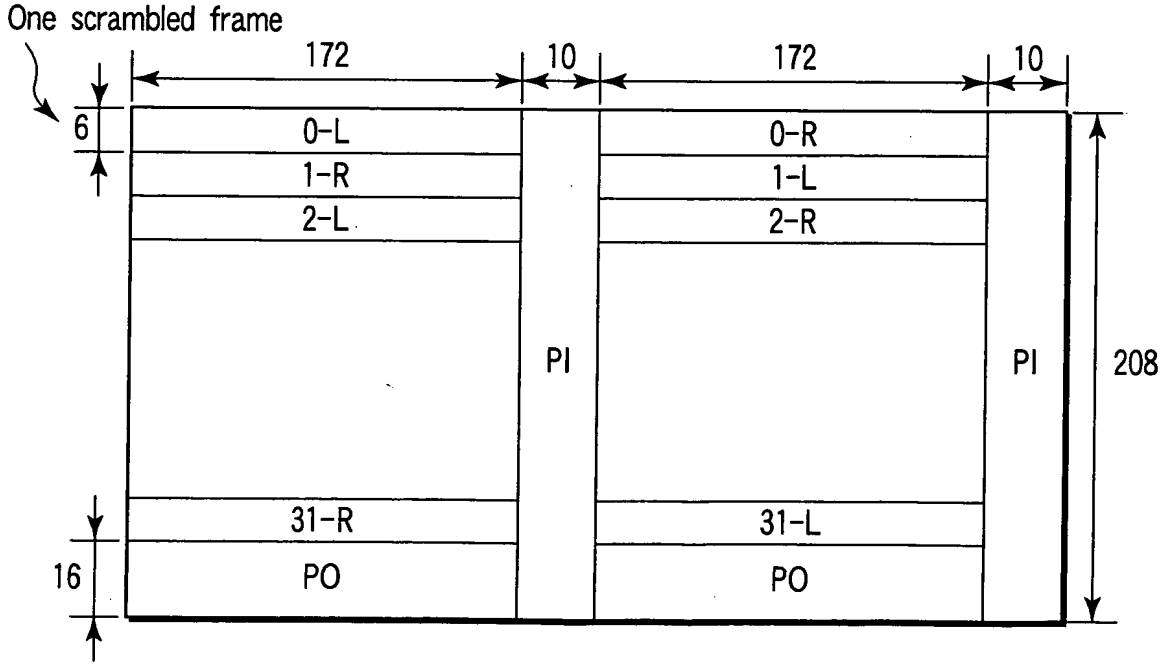

FIG. 17

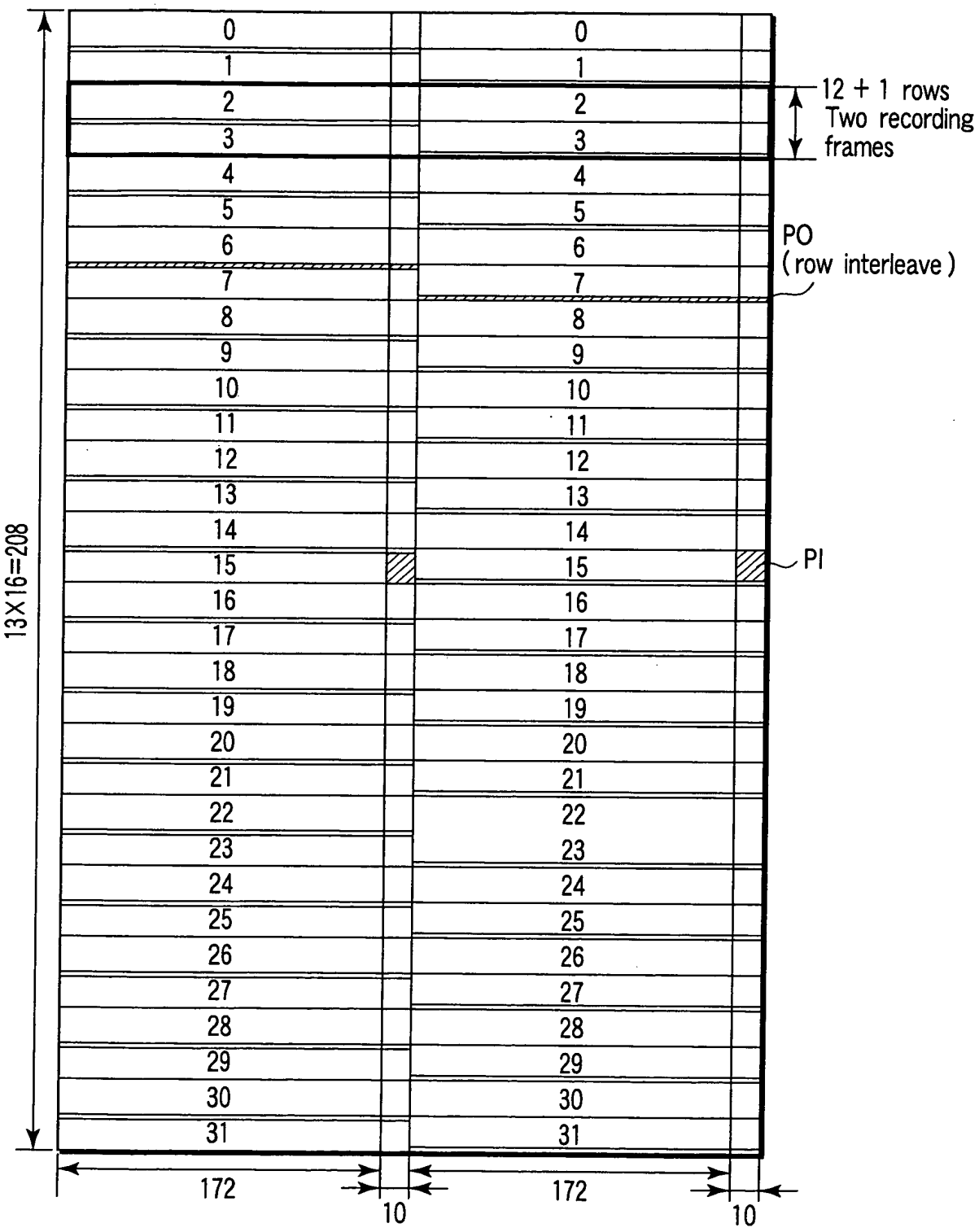
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
12 + 1 rows
Two recording
frames
PO
(row interleave)
PI
13X16=208
172
10
172
10

FIG. 18

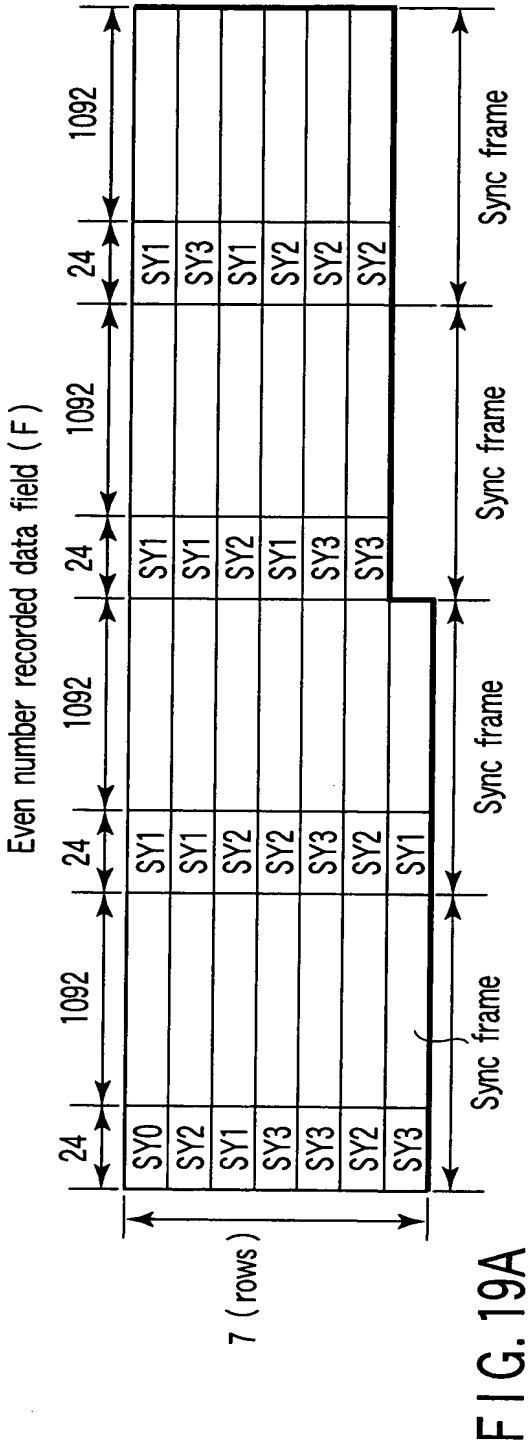

FIG. 19A

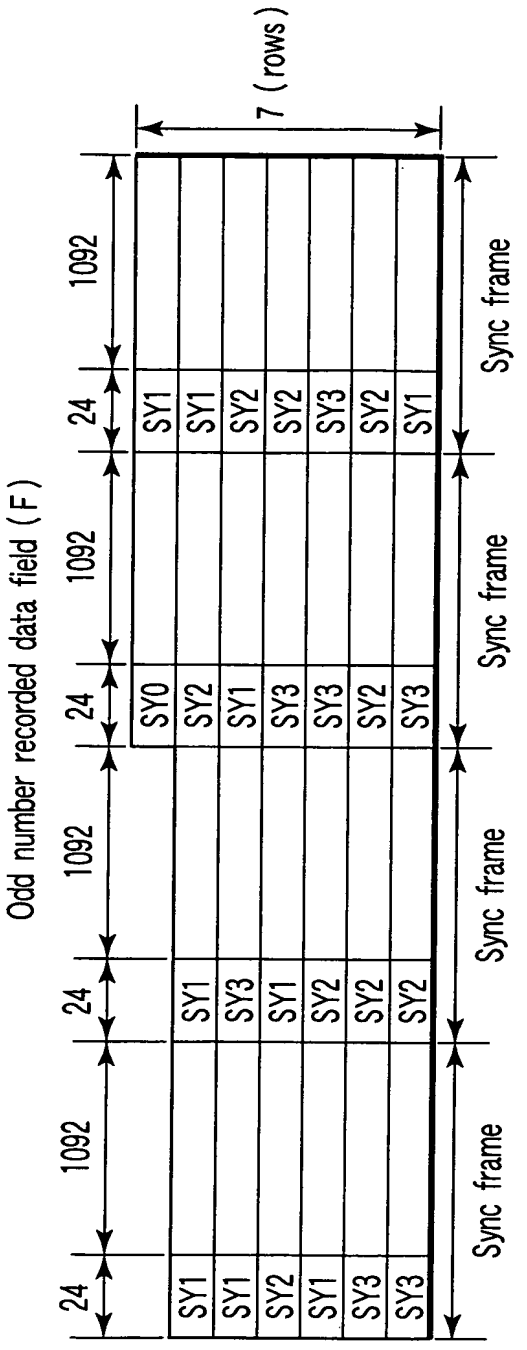

FIG. 19B

State 0

		(MSB) First SYNC code (LSB)					(MSB) Second SYNC code (LSB)			
SY0	=	000010	101000	000000	001001	/	000010	001000	000000	001001
SY1	=	100001	001000	000000	001001	/	100010	101000	000000	001001
SY2	=	100100	001000	000000	001001	/	101000	101000	000000	001001
SY3	=	101000	001000	000000	001001	/	101010	001000	000000	001001

State 1

		(MSB) First SYNC code (LSB)					(MSB) Second SYNC code (LSB)			
SY0	=	000100	101000	000000	001001	/	000100	001000	000000	001001
SY1	=	001001	001000	000000	001001	/	001010	101000	000000	001001
SY2	=	010000	101000	000000	001001	/	010000	001000	000000	001001
SY3	=	010100	001000	000000	001001	/	010101	001000	000000	001001

Sync code

FIG. 20

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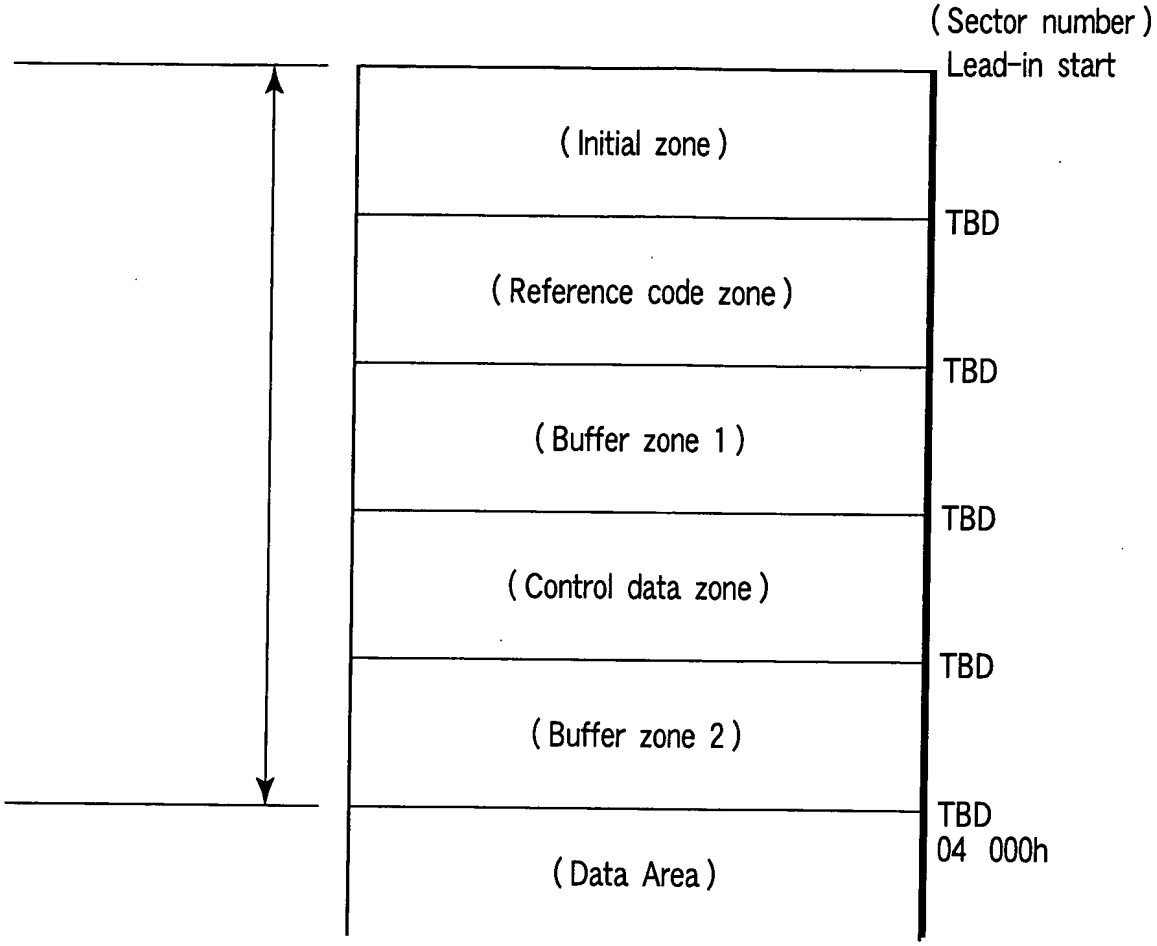

(Sector number)
Lead-in start
(Initial zone)
TBD
(Reference code zone)
TBD
(Buffer zone 1)
TBD
(Control data zone)
TBD
(Buffer zone 2)
TBD
04 000h
(Data Area)

FIG. 21

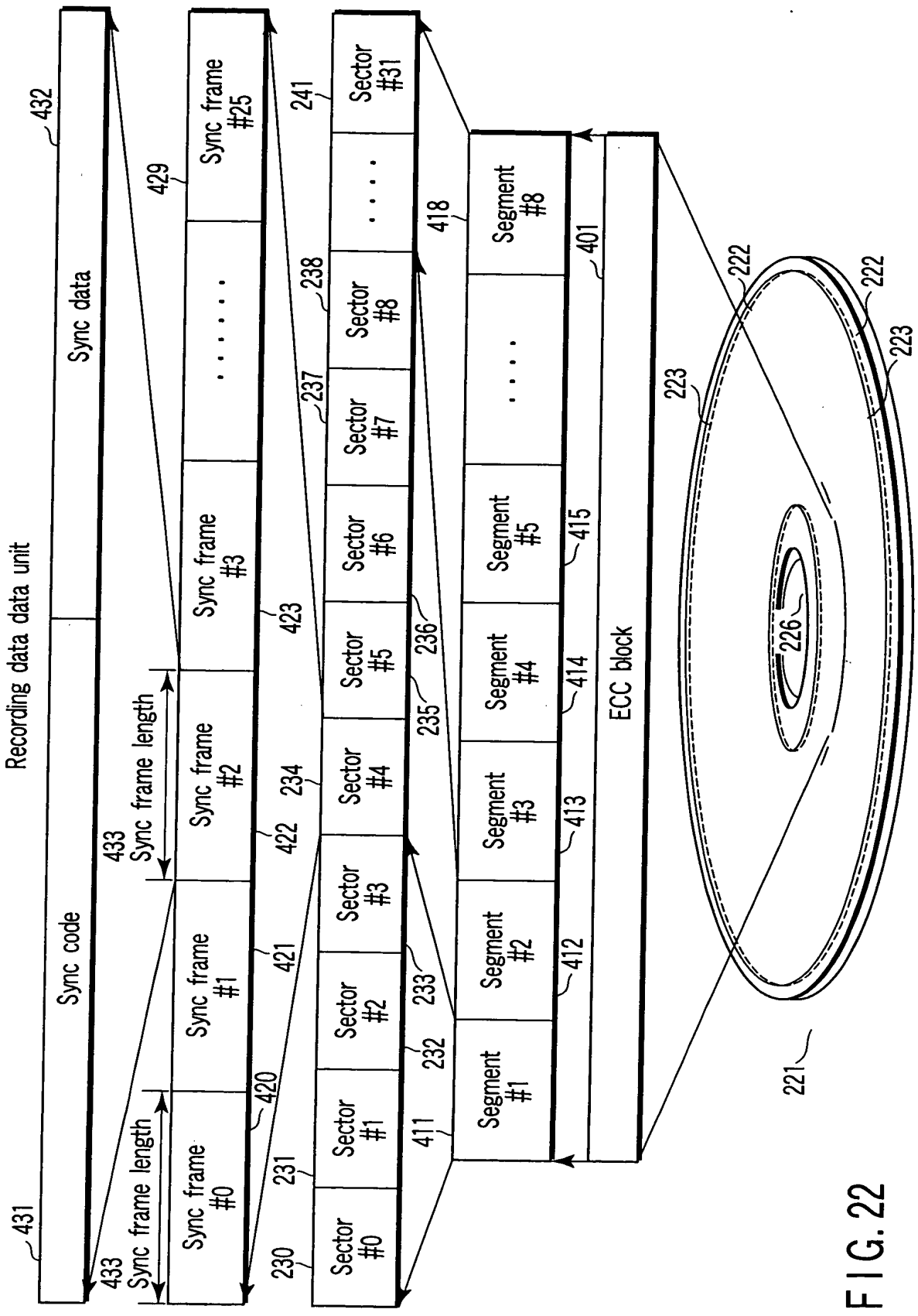

Recording data data unit
Sync code
Sync data
Sync frame length
Sync frame length
Sync frame #0
Sync frame #1
Sync frame #2
Sync frame #3
Sync frame #25
Sector #0
Sector #1
Sector #2
Sector #3
Sector #4
Sector #5
Sector #6
Sector #7
Sector #8
Sector #31
Segment #1
Segment #2
Segment #3
Segment #4
Segment #5
Segment #8
ECC block
431
432
433
433
420
421
422
423
429
230
231
232
233
234
235
236
237
238
241
411
412
413
414
415
418
401
221
222
222
223
223
226

FIG. 22

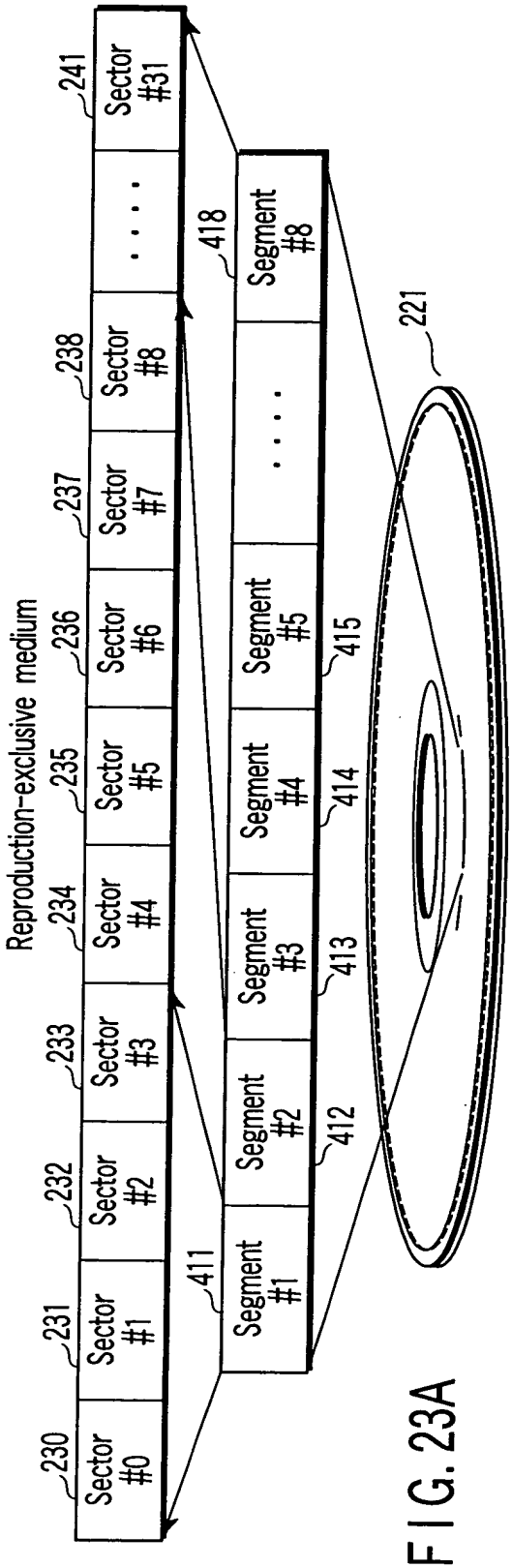


FIG. 23A

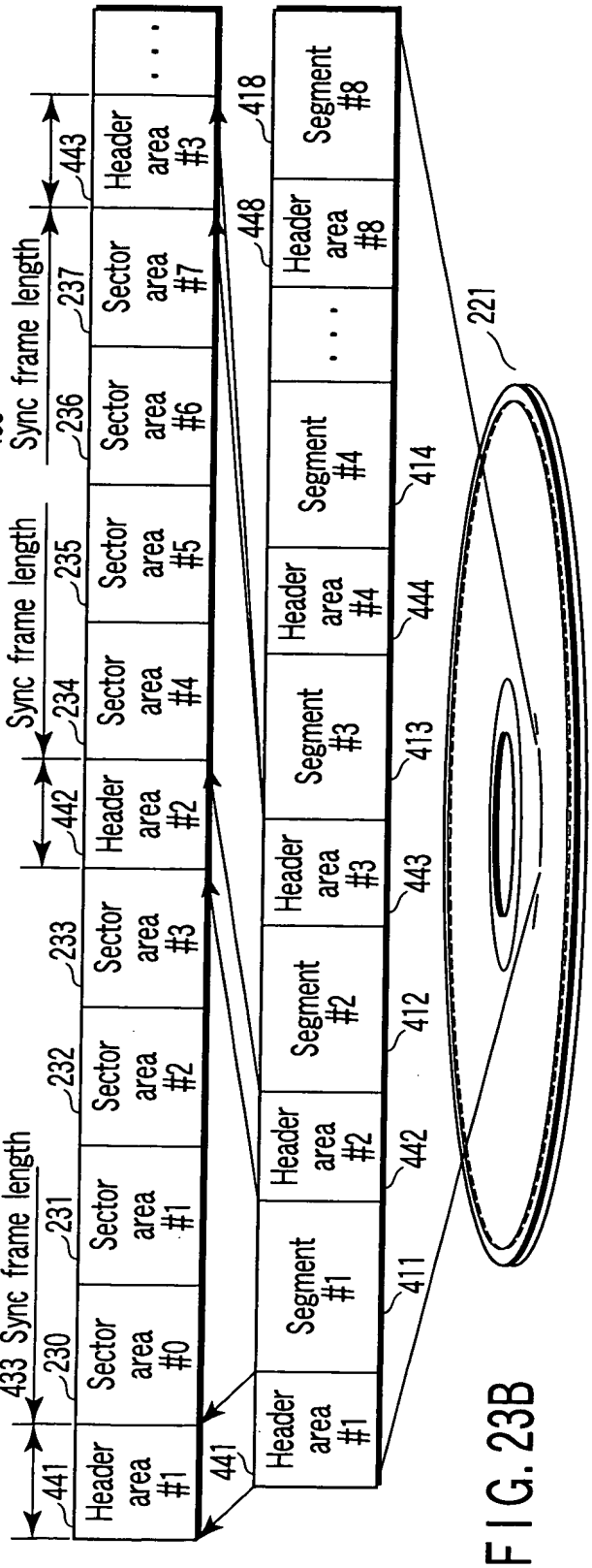


FIG. 23B

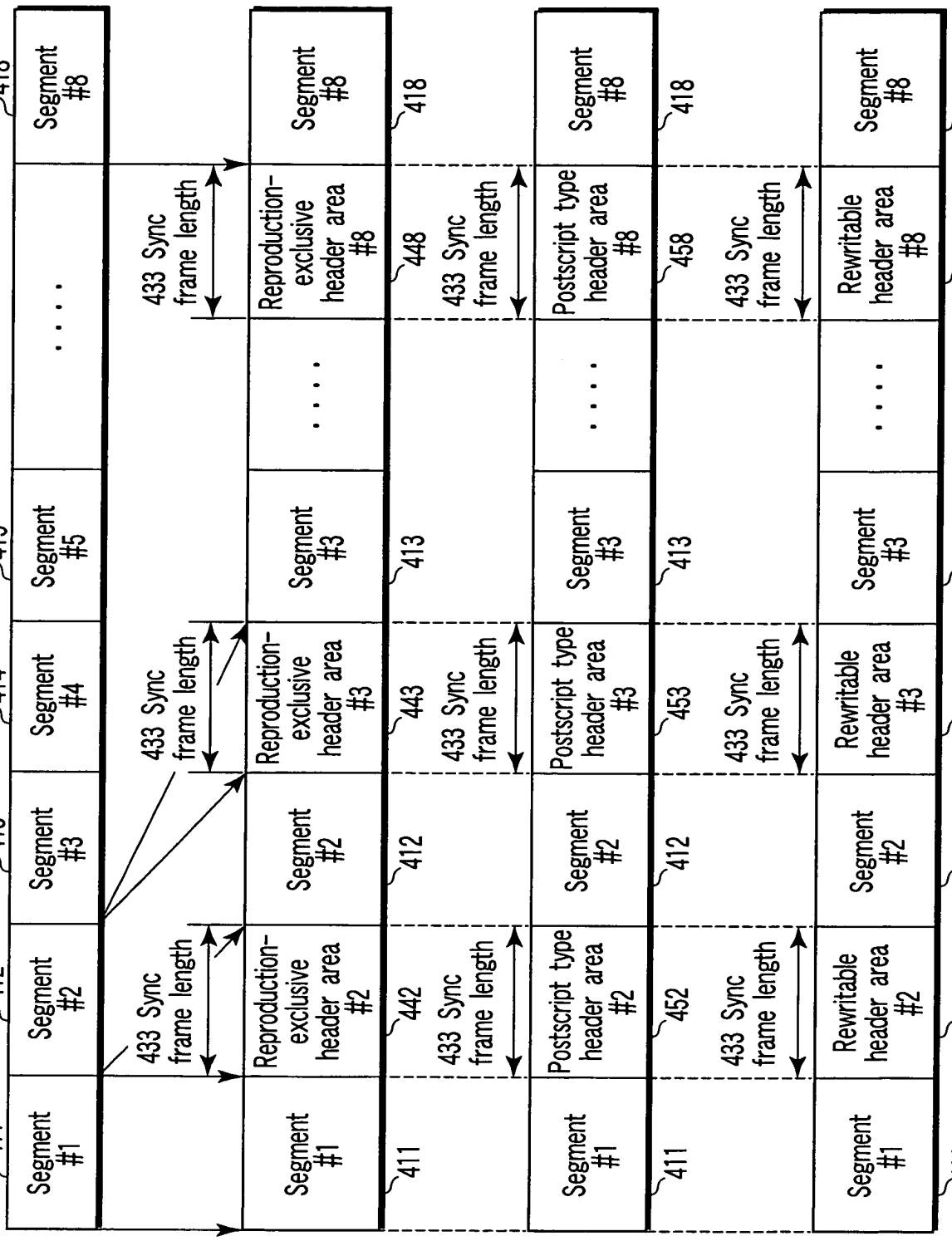


FIG. 24A

FIG. 24B

FIG. 24C

FIG. 24D

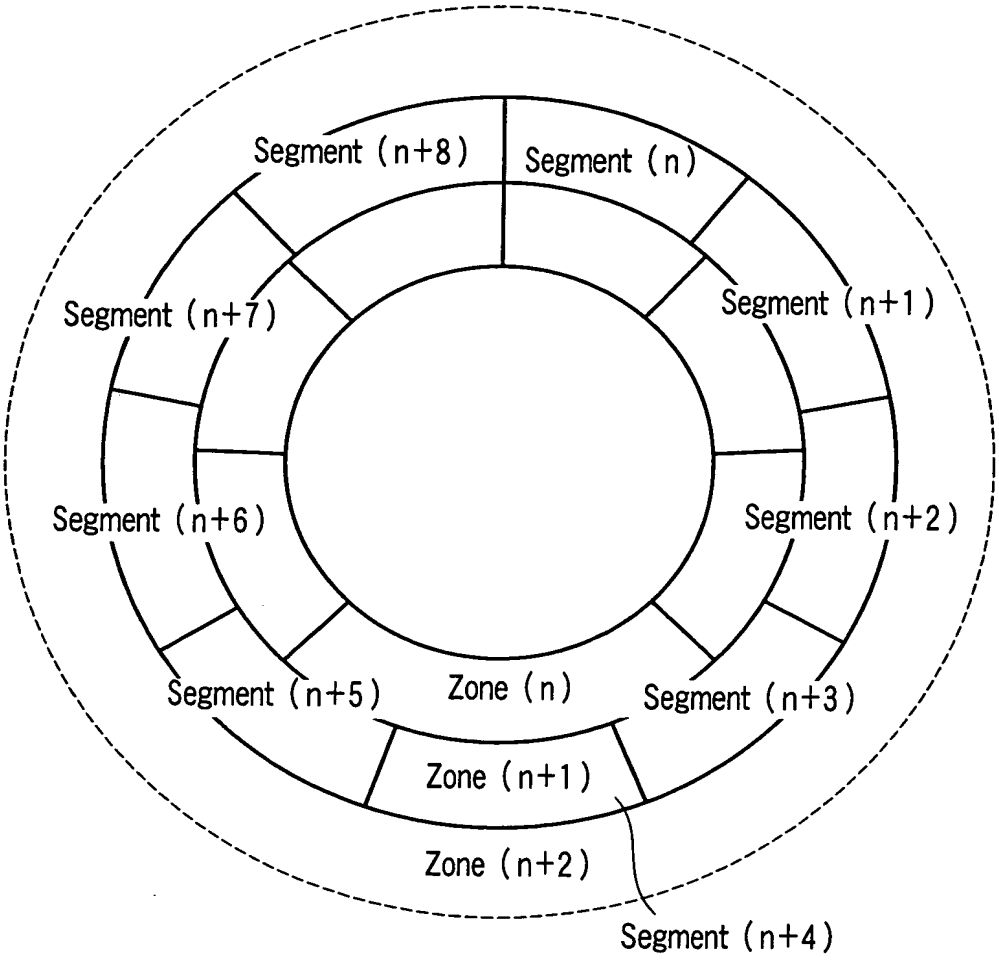
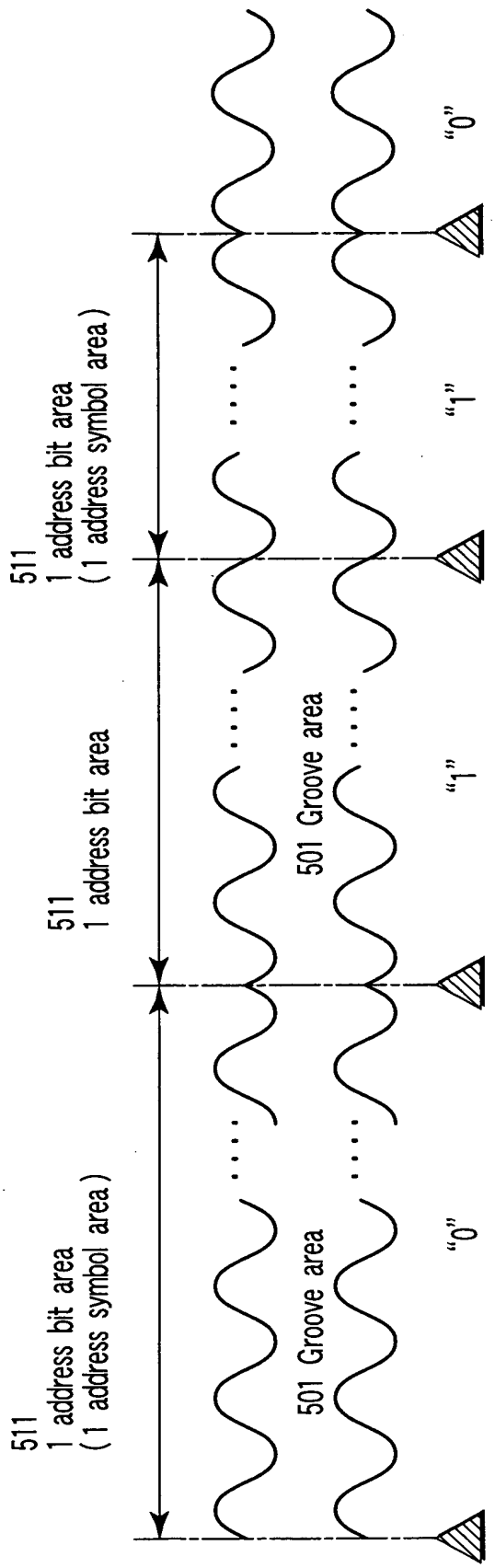

Segment (n+8)
Segment (n)
Segment (n+7)
Segment (n+1)
Segment (n+6)
Segment (n+2)
Segment (n+5)
Zone (n)
Segment (n+3)
Zone (n+1)
Zone (n+2)
Segment (n+4)

FIG. 25



☆ 1 address bit area 511 (expressed by 8 or 12 wobbles)
☆ Frequency, amplitude, and phase of wobble in 1 address bit area are fixed everywhere
☆ Boundary of 1 address bit area 511 (phase is shifted by 180° or 0°)

FIG. 26

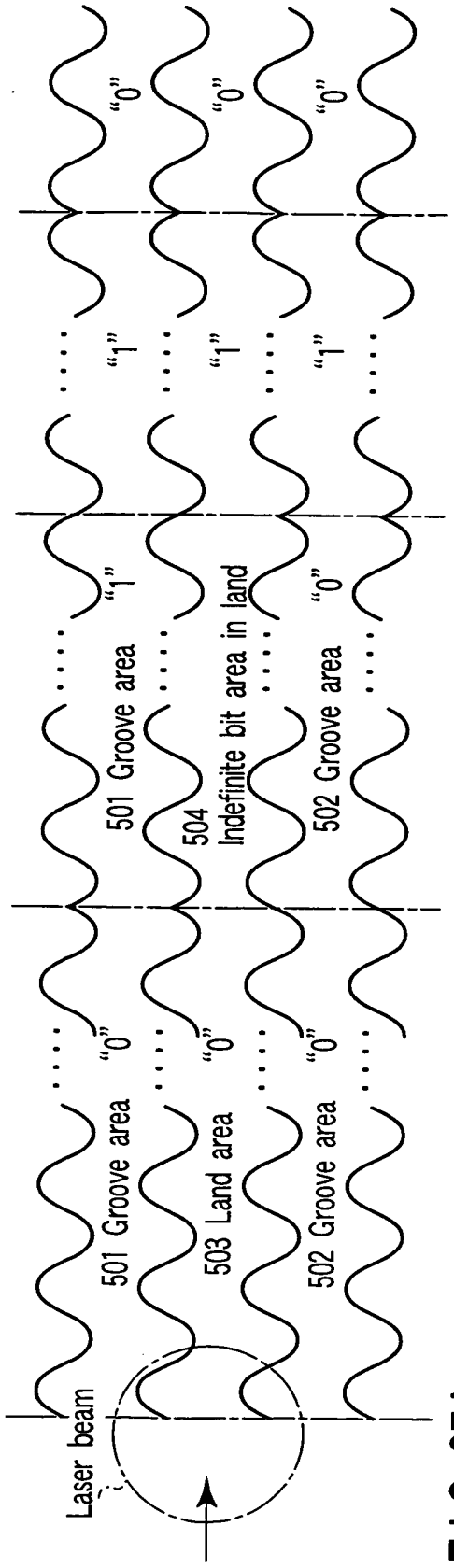


FIG. 27A

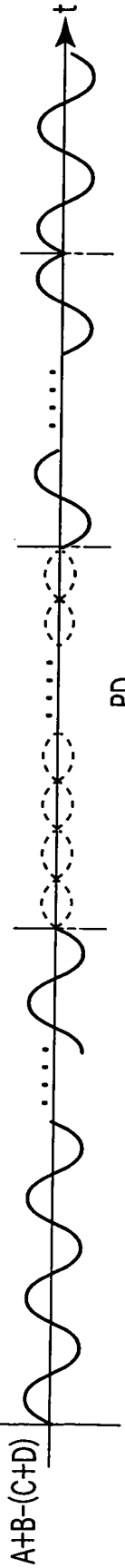


FIG. 27B

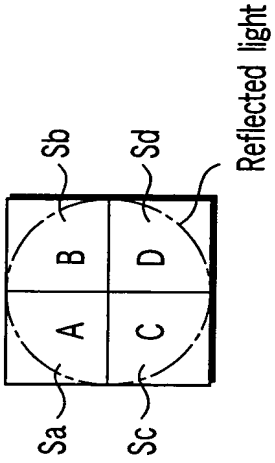


FIG. 27C

Decimal number	Conventional binary notation	Gray code notation
0	0000	0000
1	0001	0001
2	0010	0011
3	0011	0010
4	0100	0110
5	0101	0111
6	0110	0101
7	0111	0100
8	1000	1100
9	1001	1101
10	1010	1111
11	1011	1110
12	1100	1010
13	1101	1011
14	1110	1001
15	1111	1000

FIG. 28

Decimal number	Conventional binary notation	Special track code	Decimal number	Conventional binary notation	Special track code
0	00000	00 ··· 00000	1	00001	10 ··· 00000
2	00010	00 ··· 00001	3	00011	10 ··· 00001
4	00100	00 ··· 00011	5	00101	10 ··· 00011
6	00110	00 ··· 00010	7	00111	10 ··· 00010
8	01000	00 ··· 00110	9	01001	10 ··· 00110
10	01010	00 ··· 00111	11	01011	10 ··· 00111
12	01100	00 ··· 00101	13	01101	10 ··· 00101
14	01110	00 ··· 00100	15	01111	10 ··· 00100
16	10000	00 ··· 01100	17	10001	10 ··· 01100
18	10010	00 ··· 01101	19	10011	10 ··· 01101
20	10100	00 ··· 01111	21	10101	10 ··· 01111
22	10110	00 ··· 01110	23	10111	10 ··· 01110
24	11000	00 ··· 01010	25	11001	10 ··· 01010
26	11010	00 ··· 01011	27	11011	10 ··· 01011
28	11100	00 ··· 01001	29	11101	10 ··· 01001
30	11110	00 ··· 01000	31	11111	10 ··· 01000

FIG. 29

Note] "2n" and "2n+1" differ only in most significant bit. All other lower bits are the same.

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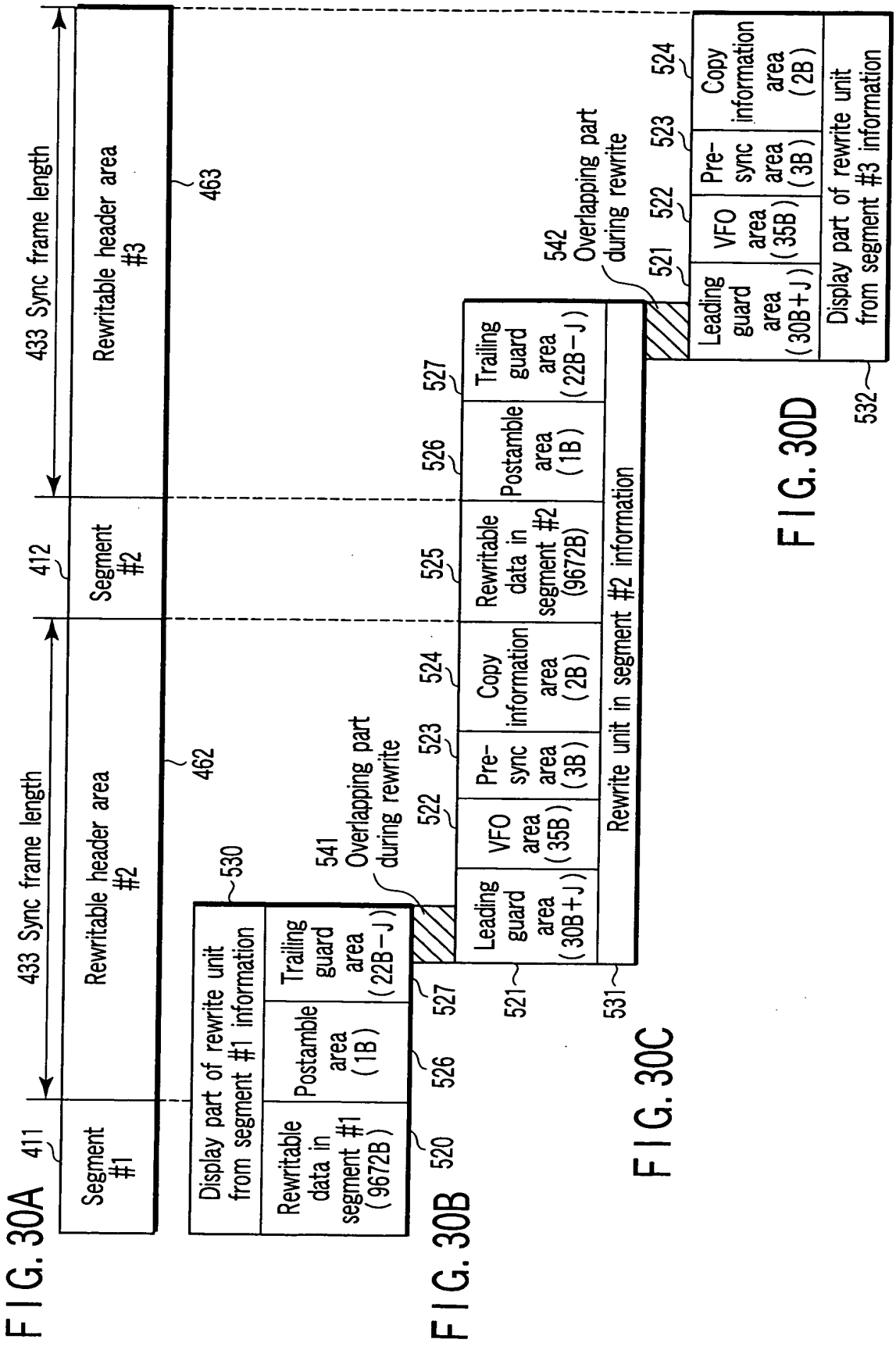

FIG. 30A

FIG. 30B

FIG. 30C

FIG. 30D

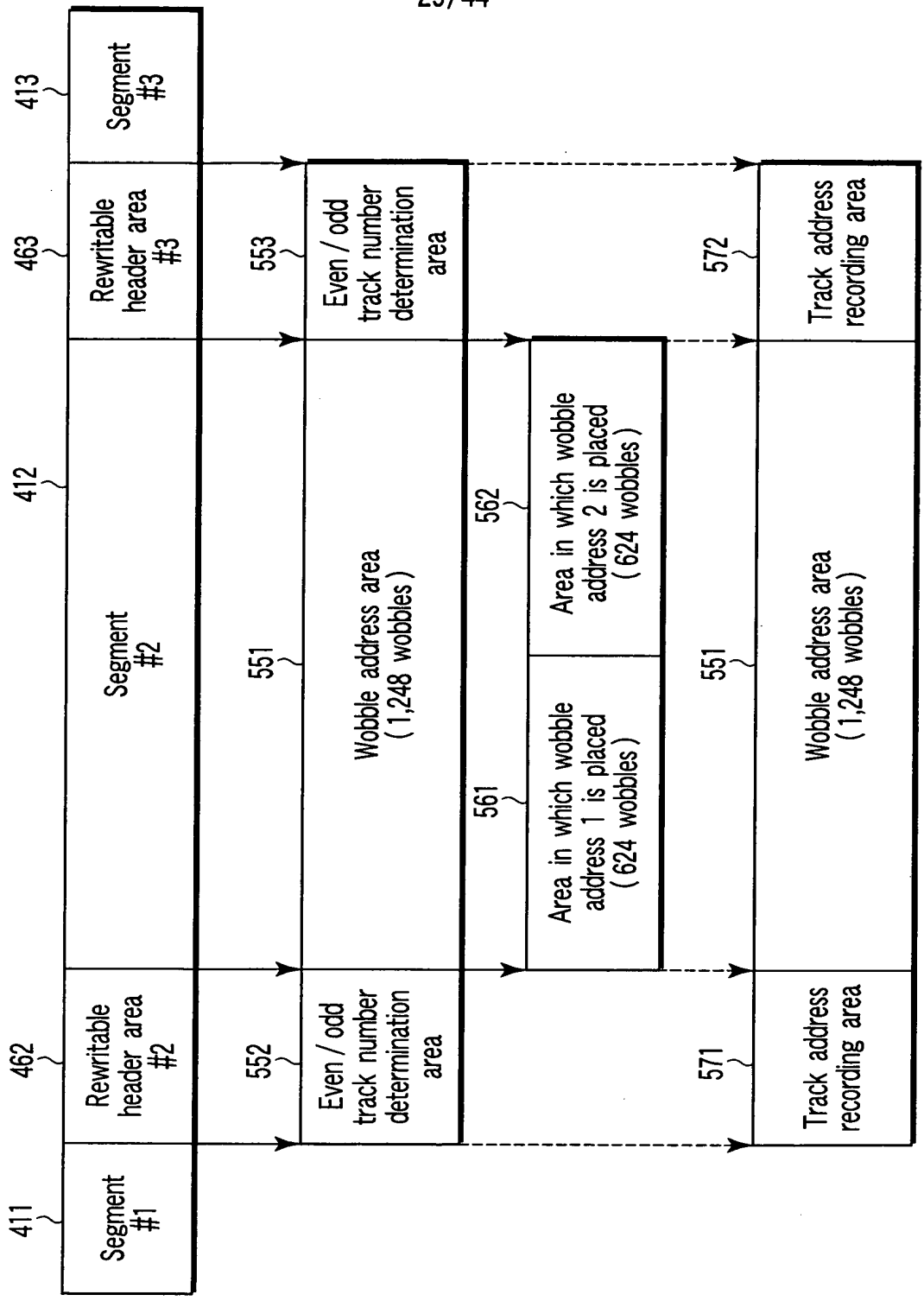

FIG. 31A

FIG. 31B

FIG. 31C

FIG. 31D

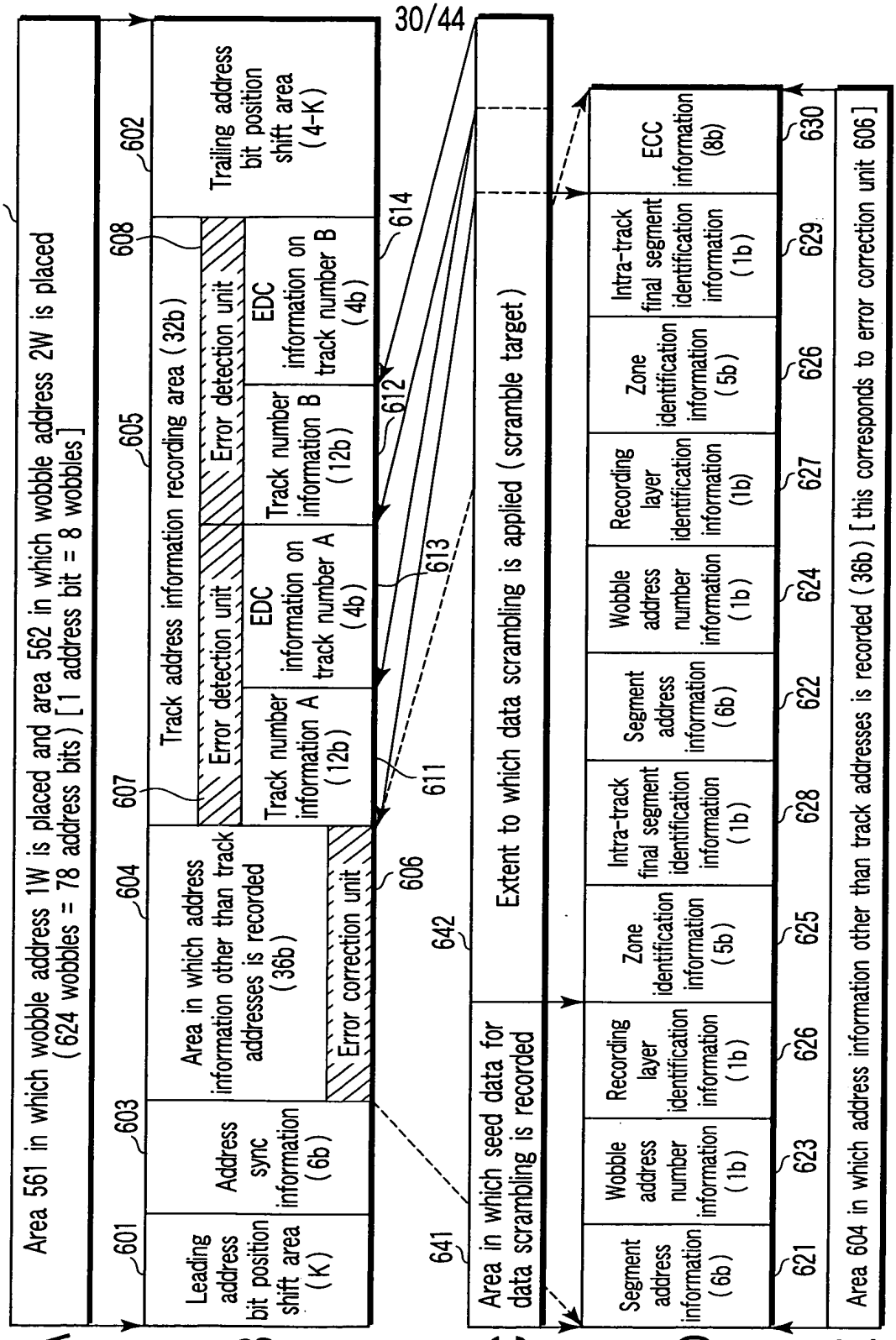

FIG. 32A

FIG. 32B

FIG. 32C

FIG. 32D

FIG. 32E

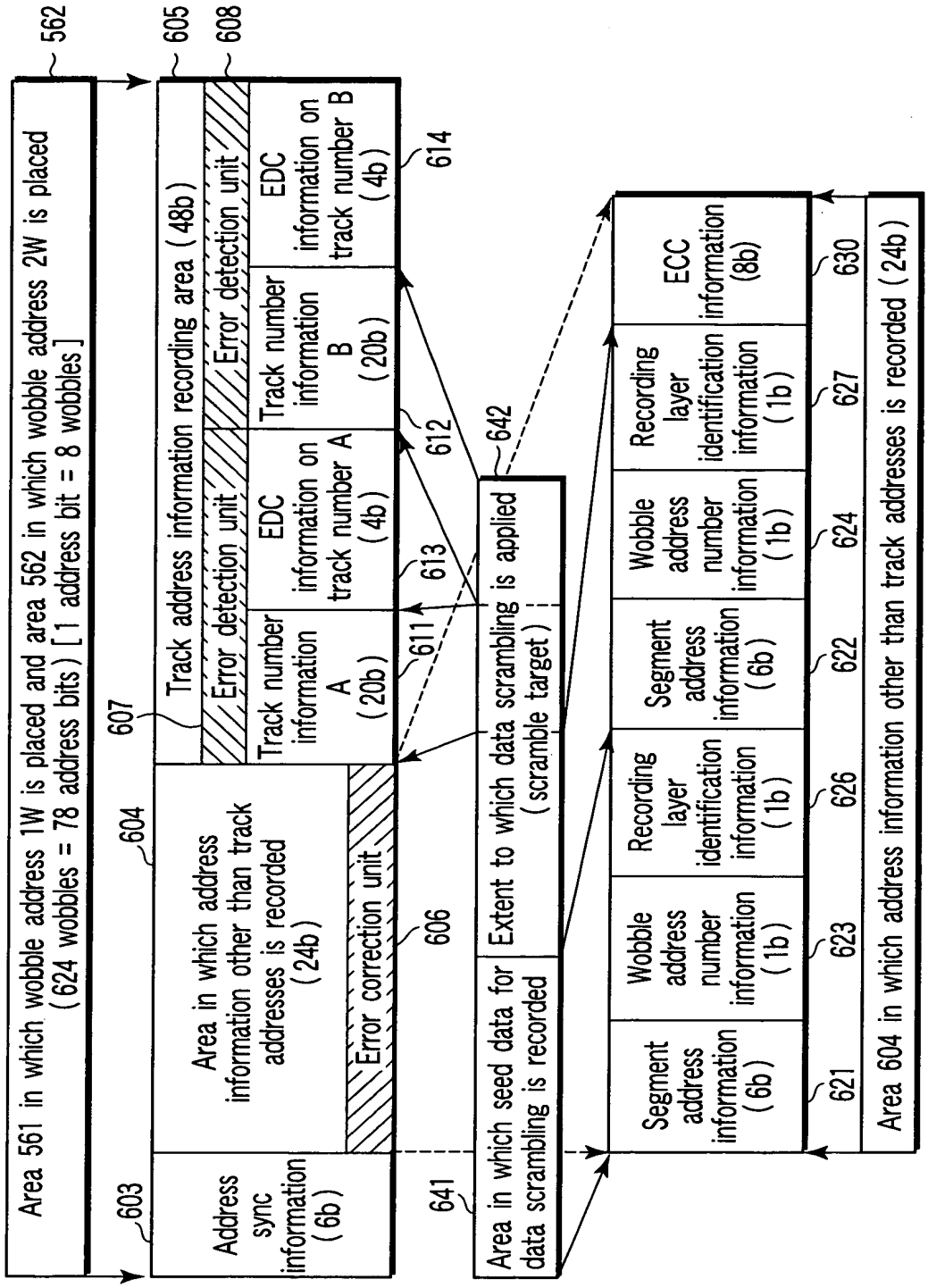

FIG. 33A

FIG. 33B

FIG. 33C

FIG. 33D

FIG. 33E

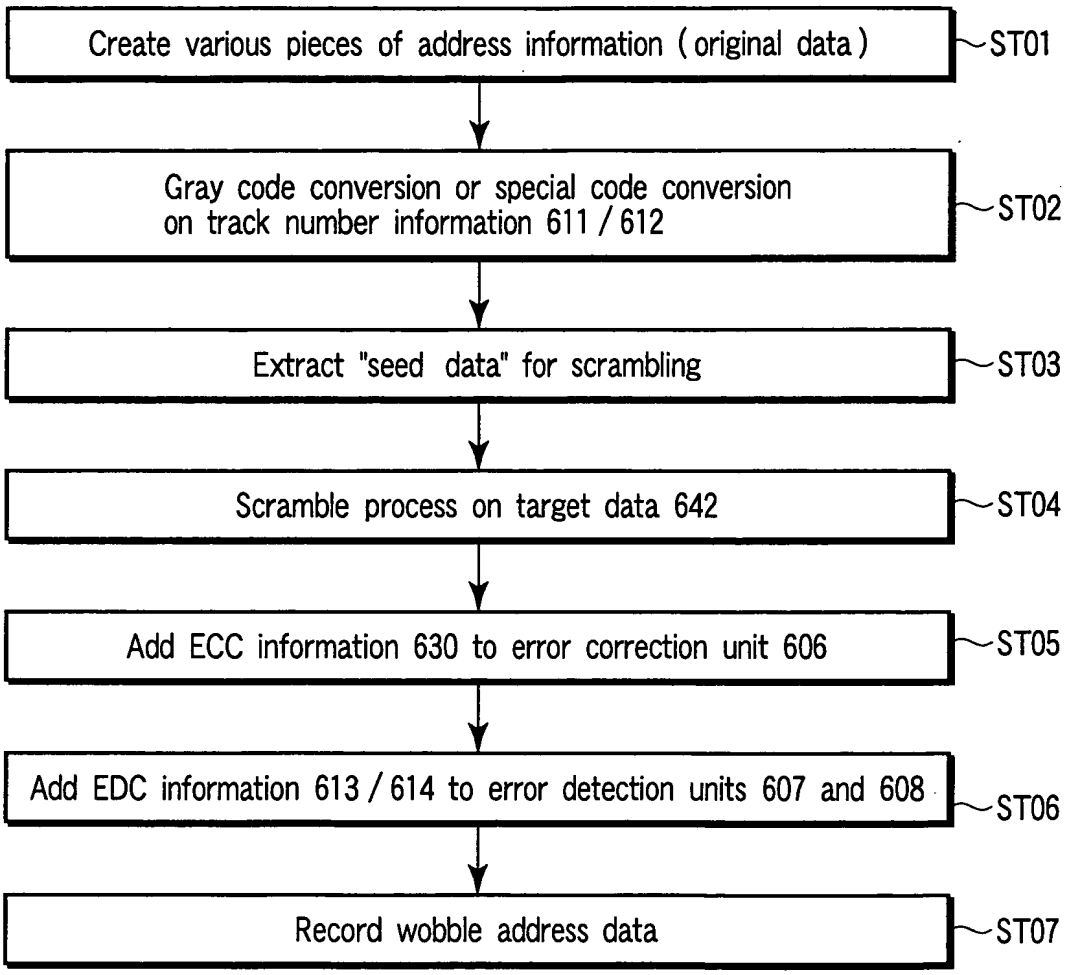
Create various pieces of address information (original data)
ST01
Gray code conversion or special code conversion on track number information 611 / 612
ST02
Extract "seed data" for scrambling
ST03
Scramble process on target data 642
ST04
Add ECC information 630 to error correction unit 606
ST05
Add EDC information 613 / 614 to error detection units 607 and 608
ST06
Record wobble address data
ST07

FIG. 34

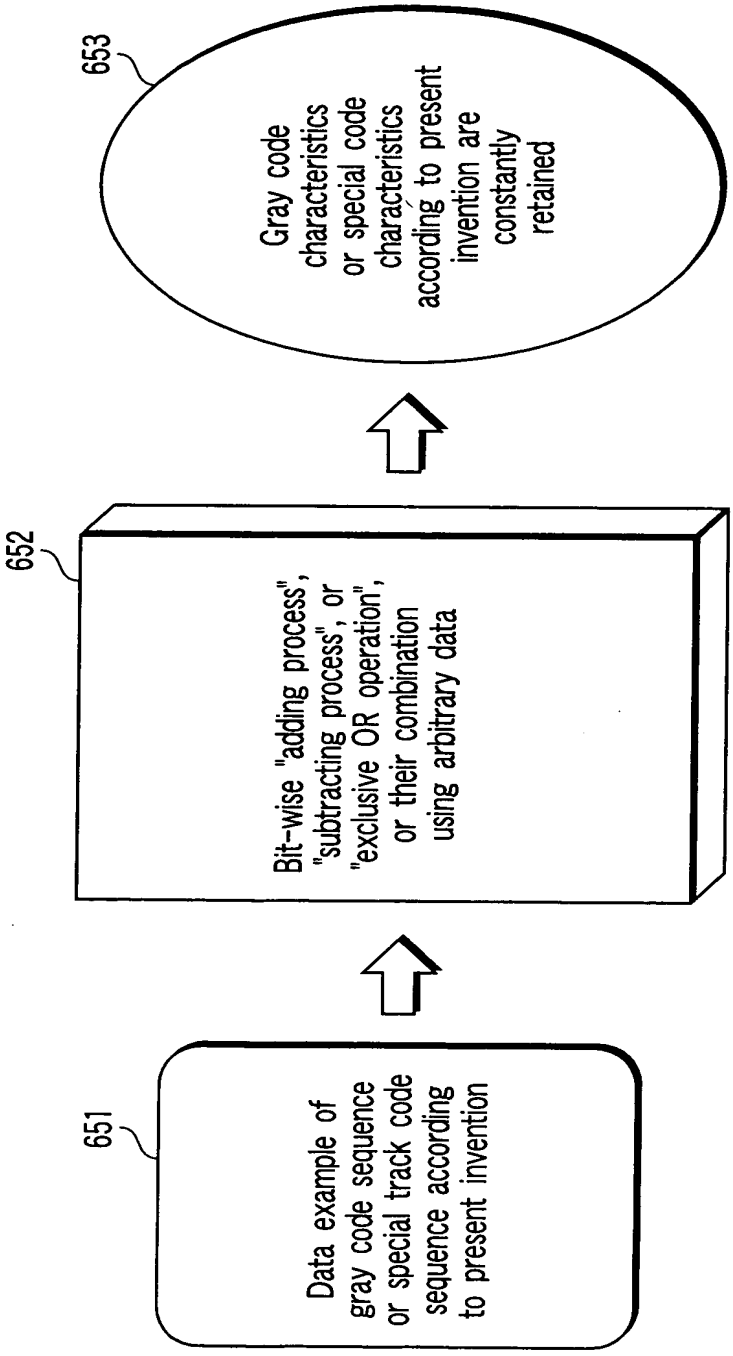
653
Gray code characteristics or special code characteristics according to present invention are constantly retained
652
Bit-wise "adding process", "subtracting process", or "exclusive OR operation", or their combination using arbitrary data
651
Data example of gray code sequence or special track code sequence according to present invention

FIG. 35

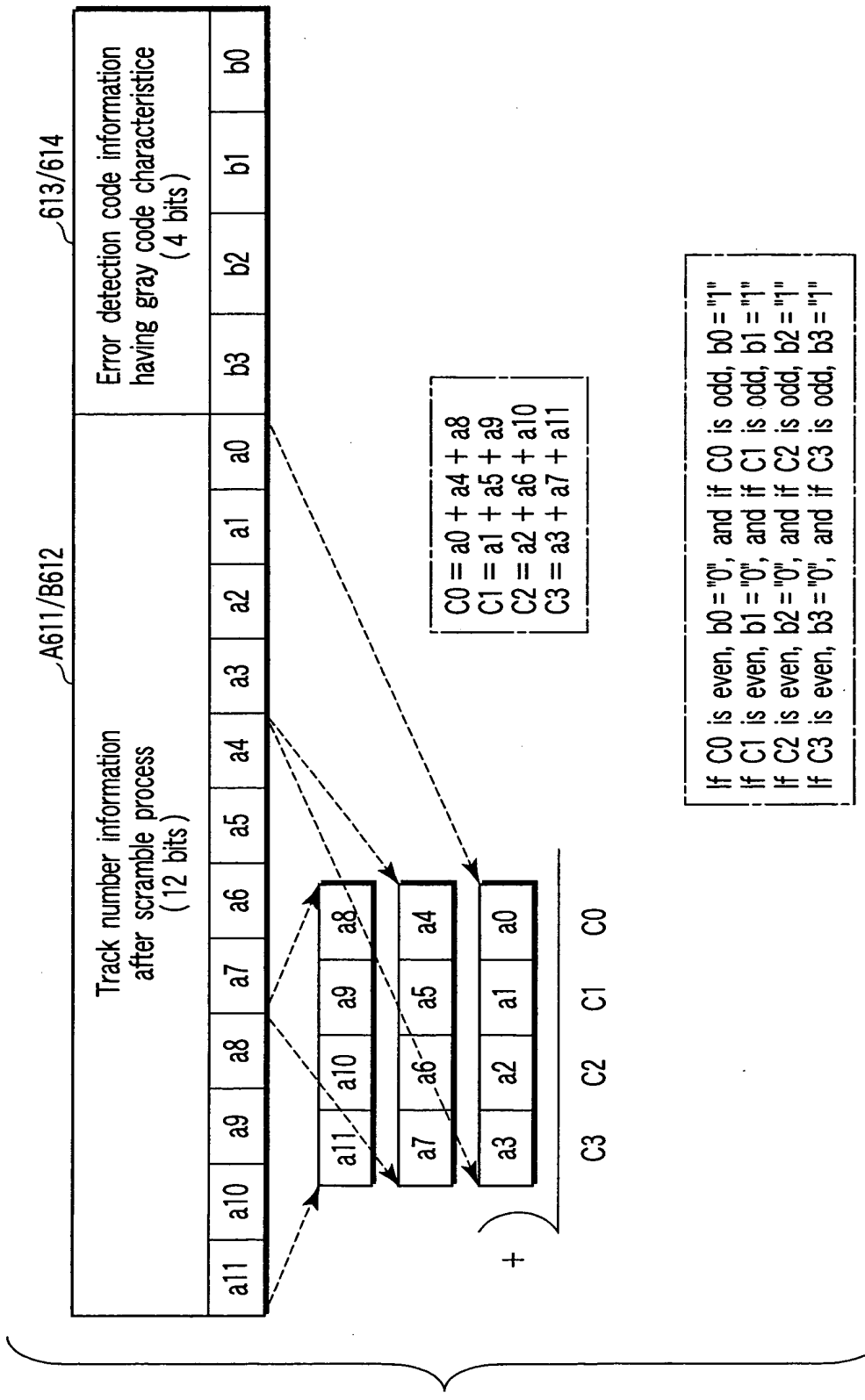
A611/B612
Track number information after scramble process (12 bits)
613/614
Error detection code information having gray code characteristice (4 bits)
a11 a10 a9 a8 a7 a6 a5 a4 a3 a2 a1 a0
b3 b2 b1 b0
C0 = a0 + a4 + a8
C1 = a1 + a5 + a9
C2 = a2 + a6 + a10
C3 = a3 + a7 + a11
If C0 is even, b0 = "0", and if C0 is odd, b0 = "1"
If C1 is even, b1 = "0", and if C1 is odd, b1 = "1"
If C2 is even, b2 = "0", and if C2 is odd, b2 = "1"
If C3 is even, b3 = "0", and if C3 is odd, b3 = "1"
a11 a10 a9 a8
a7 a6 a5 a4
a3 a2 a1 a0
+
C3 C2 C1 C0

FIG. 36

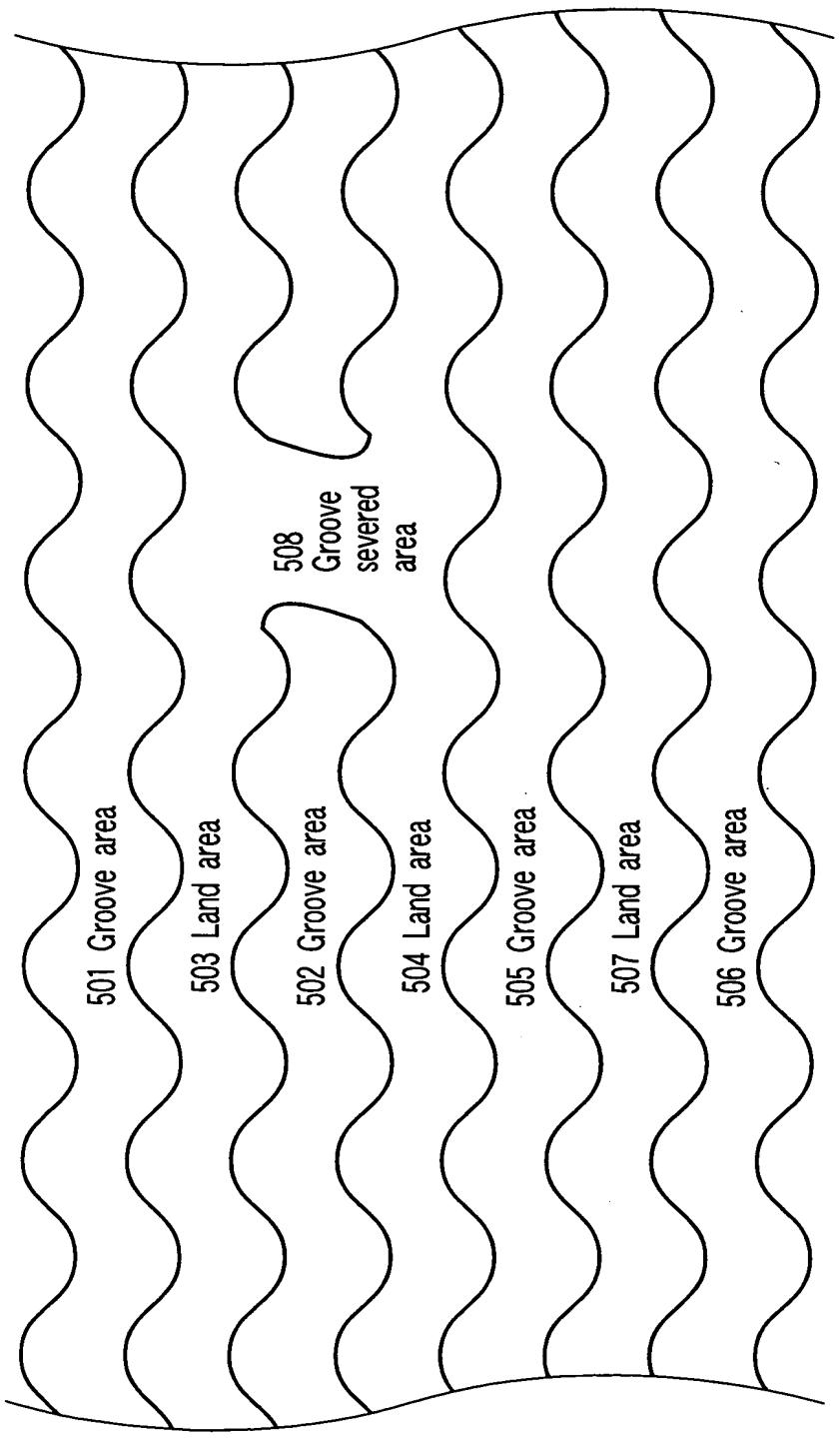
501 Groove area
503 Land area
502 Groove area
508 Groove severed area
504 Land area
505 Groove area
507 Land area
506 Groove area

FIG. 37

L / G identification	Track number	Track number information A611	Track number information B612
Groove	2n+3	2n+4	2n+3
Land	2n+3	Indefinite (2n+2 or 2n+3)	2n+3
Groove	2n+2	2n+2	2n+3
Land	2n+2	2n+2	Indefinite (2n+1 or 2n+3)
Groove	2n+1	2n+2	2n+1
Land	2n+1	Indefinite (2n or 2n+2)	2n+1
Groove	2n	2n	2n+1

FIG. 38

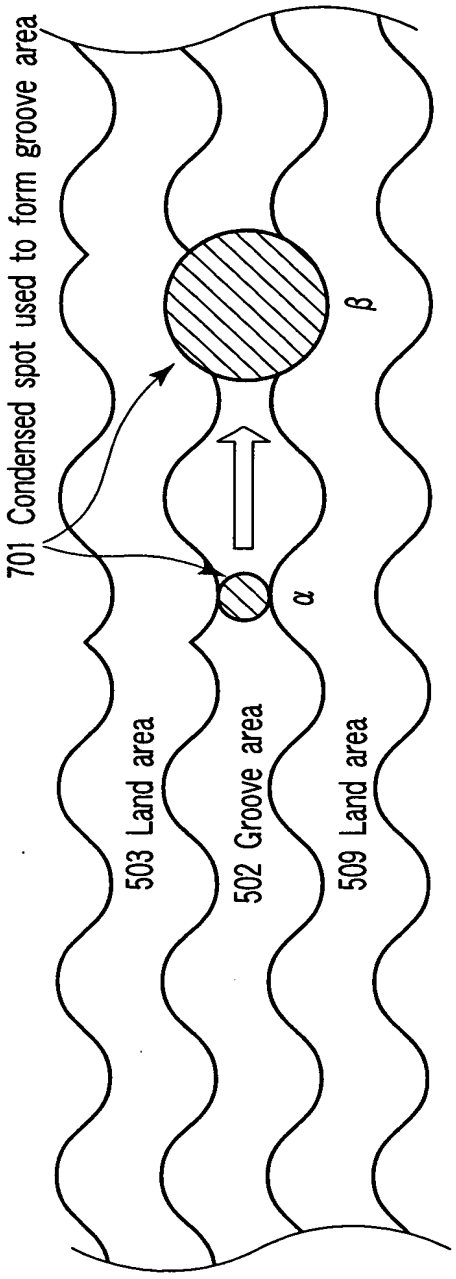

FIG. 39A

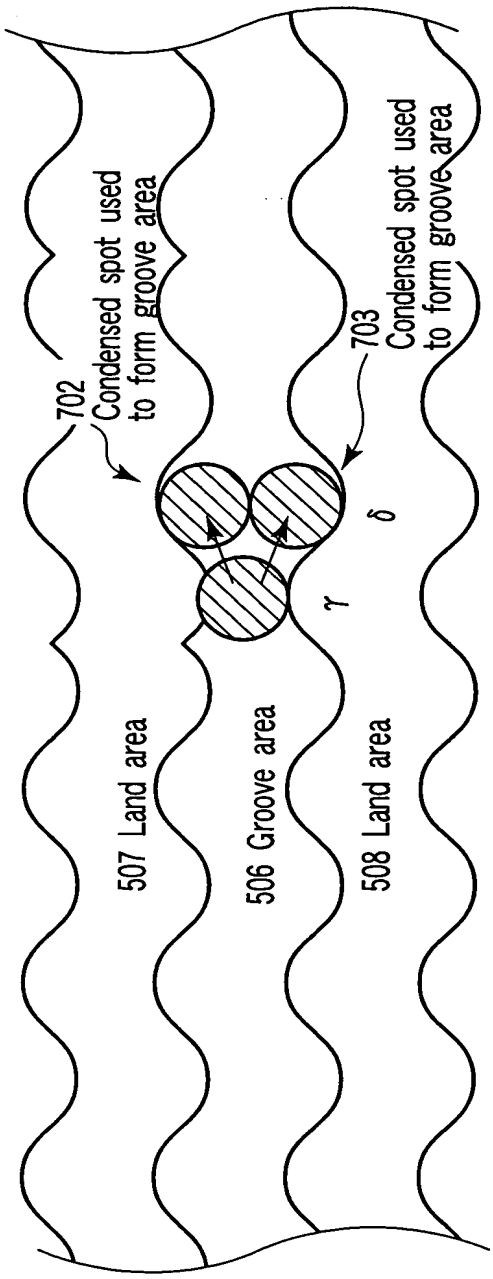

FIG. 39B

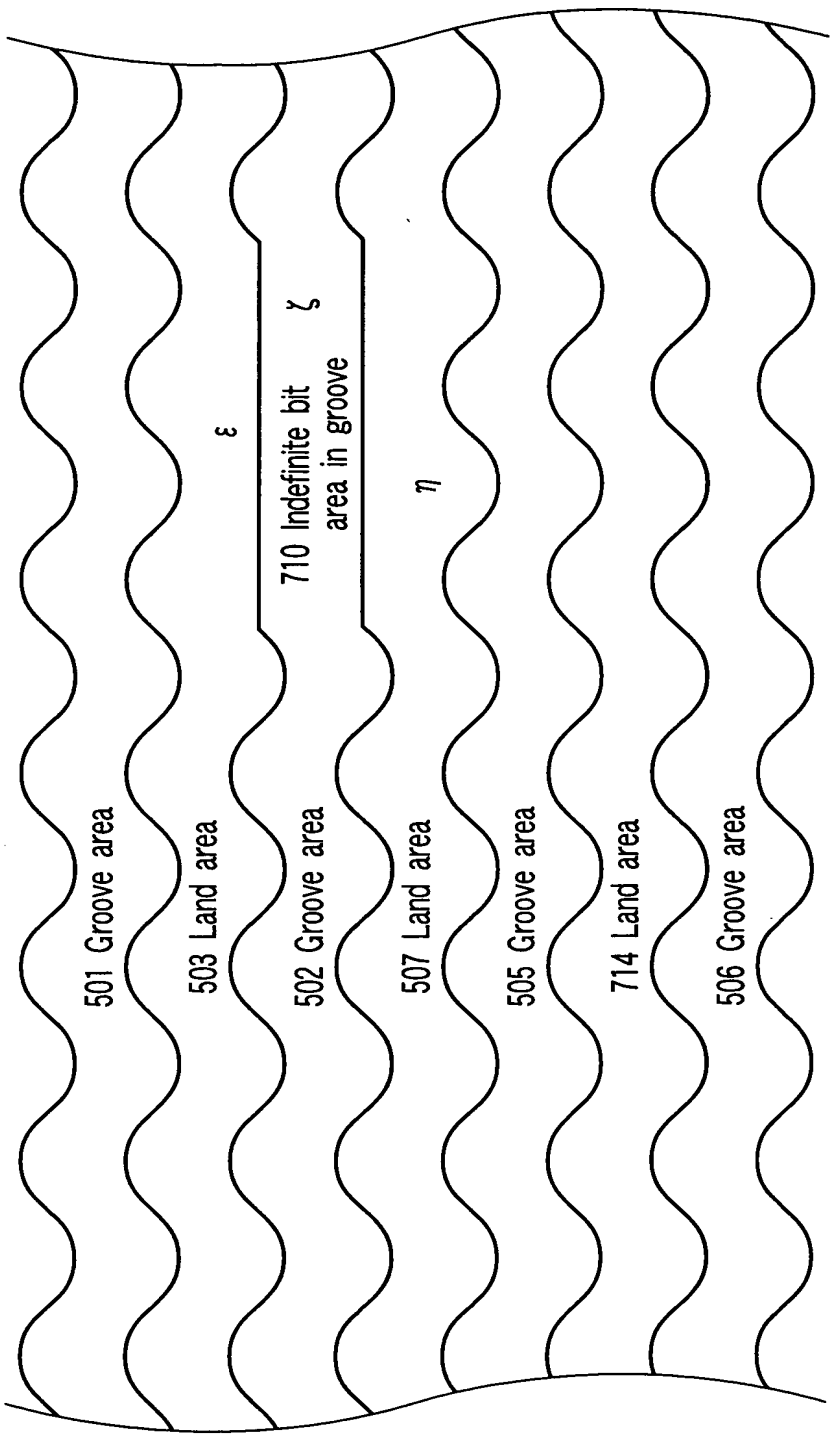
501 Groove area
503 Land area
ε
710 Indefinite bit area in groove
ζ
502 Groove area
507 Land area
η
505 Groove area
714 Land area
506 Groove area

FIG. 40

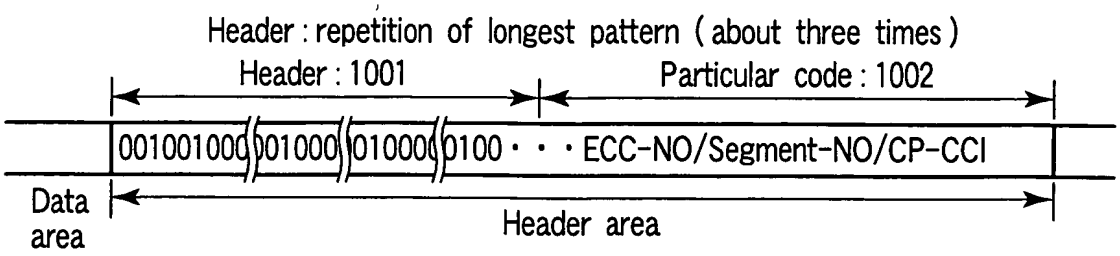
Header : repetition of longest pattern (about three times)
Header : 1001
Particular code : 1002
00100100
01000
01000
0100 · · · ECC-NO/Segment-NO/CP-CCI
Data area
Header area

FIG. 41

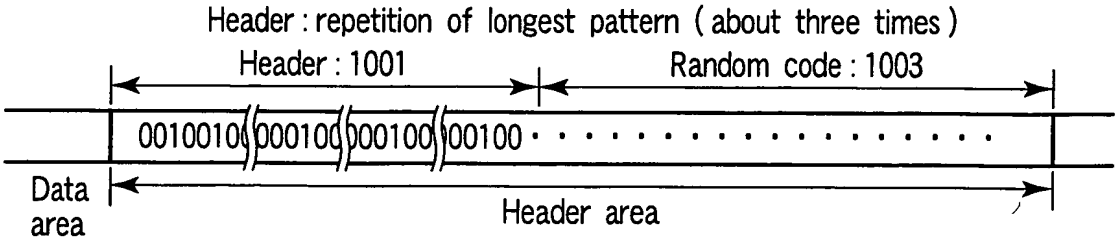
Header : repetition of longest pattern (about three times)
Header : 1001
Random code : 1003
00100100
00100
00100
00100 · · · · · · · · · · · · · · · · · ·
Data area
Header area

FIG. 42

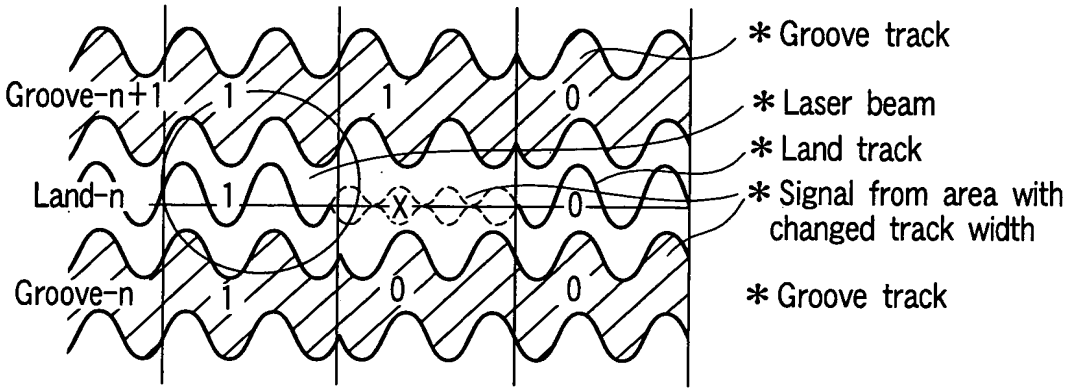

FIG. 43

Track form	Detected track number
Groove	n+3
Even-land (n+2)	(n+2) or (n+3)
Groove	n+2
Odd-land (n+1)	(n+1) or (n+2)
Groove	n+1
Even-land (n)	(n) or (n+1)
Groove	n

FIG. 44

G / L track	Track number	Track number determination criteria
Groove : G(n+2)	1101	
Odd-land : L(n+1)	110*	Only 1101 or 1100 for odd-lands
Groove : G(n+1)	1100	
Even-land : L(n)	*100	Only 1100 or 0100 for even-lands
Groove : G(n)	0100	

FIG. 45

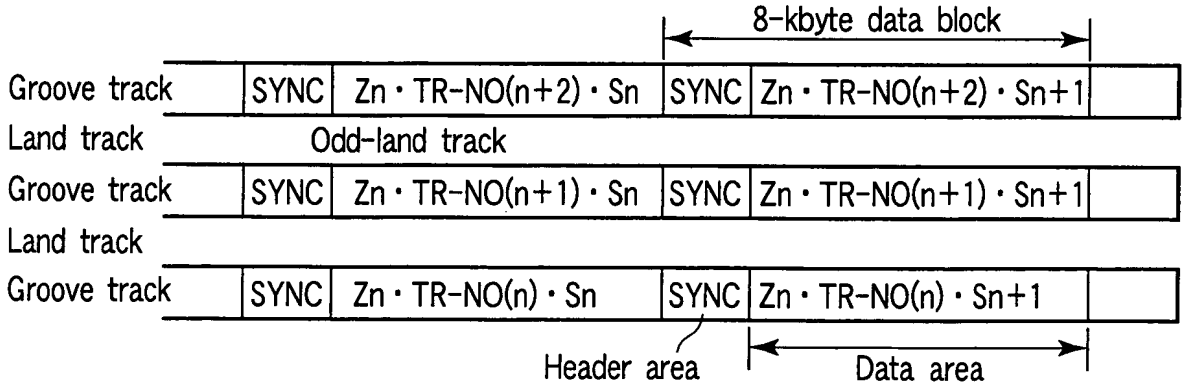

FIG. 46

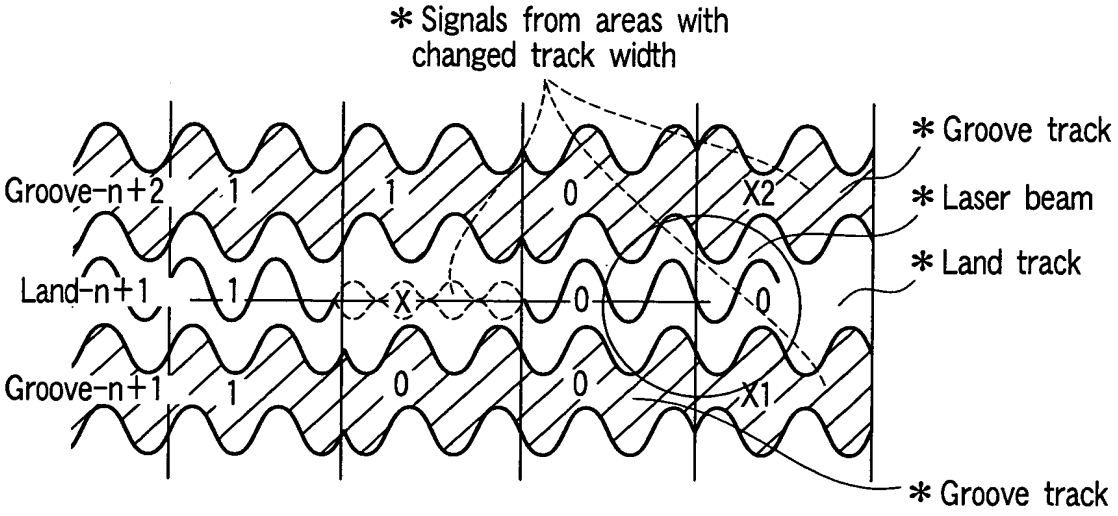

FIG. 47

Groove track	G-S 1101	L-S 11X1	G-S 1101	L-S 11X1
Land track		L-S 1101		L-S 1100
Groove track	G-S 1100	L-S X100	G-S 1100	L-S X100
Land track		L-S 0101		L-S 0100
Groove track	G-S 0101	L-S 010X	G-S 0100	L-S 010X

FIG. 48

G / L track	Track number	Track number determination criteria
Groove : G(n+2)	1101X	For grooves, only leading 4 bits are effective
Odd-land : L(n+1)	110X0	Only 11010 or 11000 for odd-lands
Groove : G(n+1)	1100X	For grooves, only leading 4 bits are effective
Even-land : L(n)	X1001	Only 11001 or 01001 for even-lands
Groove : G(n)	0100X	For grooves, only leading 4 bits are effective

FIG. 49

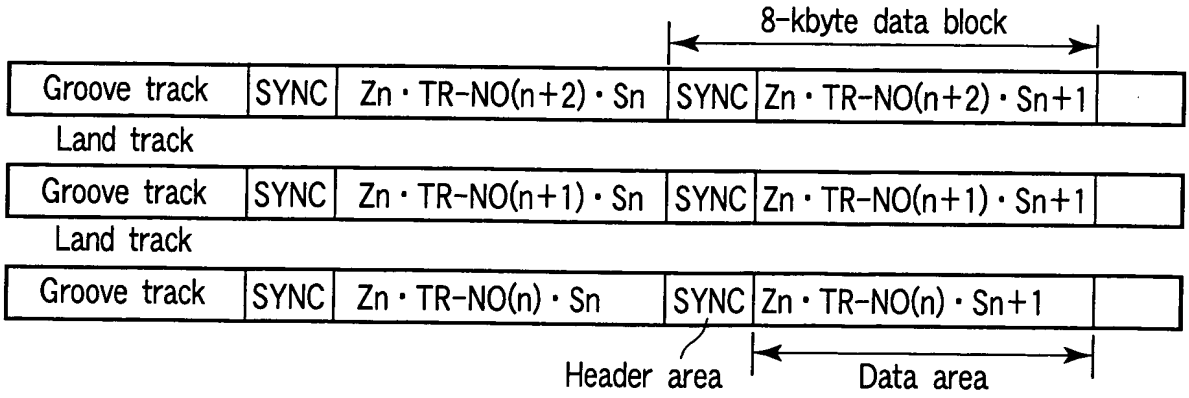

FIG. 50

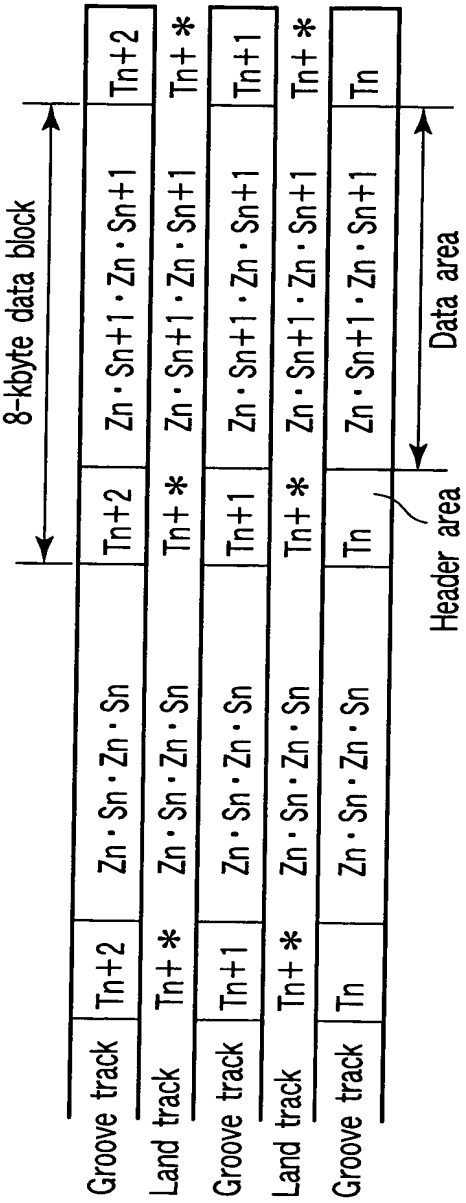
8-kbyte data block
Header area
Data area
Groove track
Land track
Groove track
Land track
Groove track
Tn+2
Tn+*
Tn+1
Tn+*
Tn
Zn · Sn · Zn · Sn
Zn · Sn+1 · Zn · Sn+1
Tn+2
Tn+*
Tn+1
Tn+*
Tn

FIG. 51